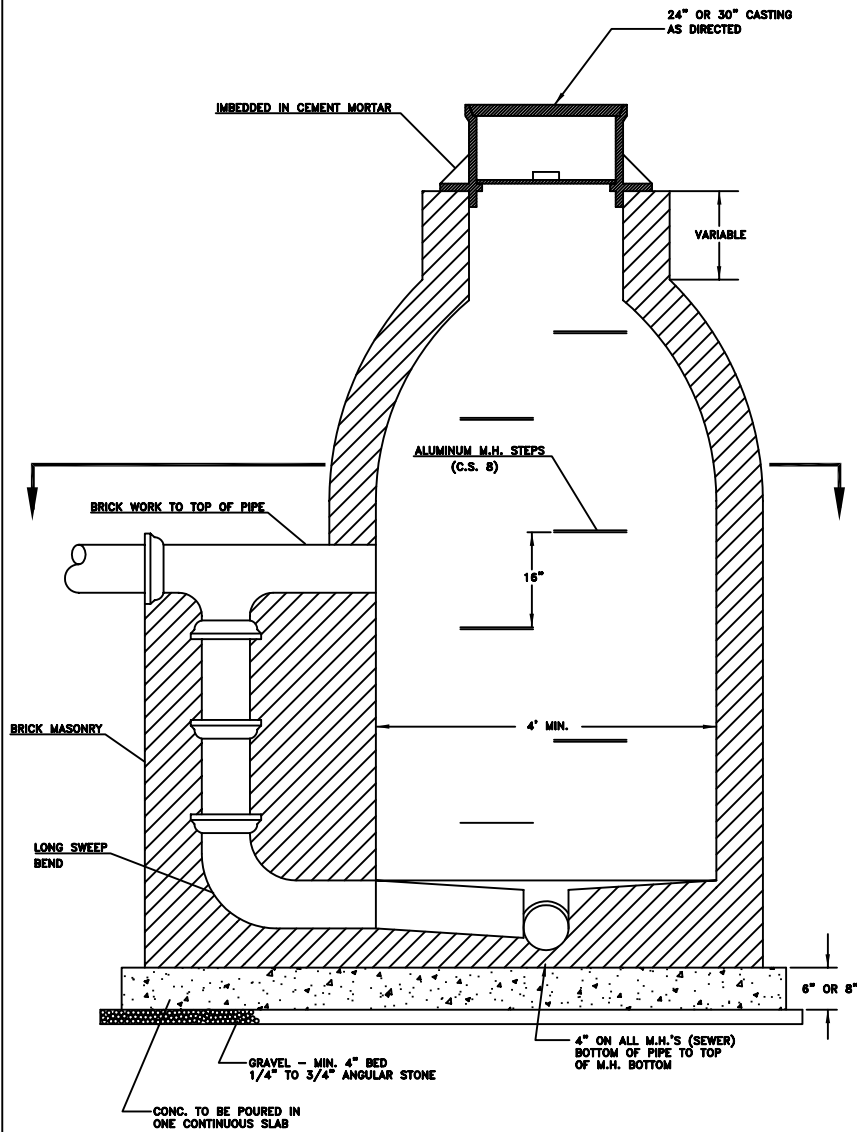


STANDARD C.I. DROP CONNECTION FOR EXISTING MANHOLE

NO SCALE

CITY OF NORFOLK, VIRGINIA
DEPT. OF UTILITIES

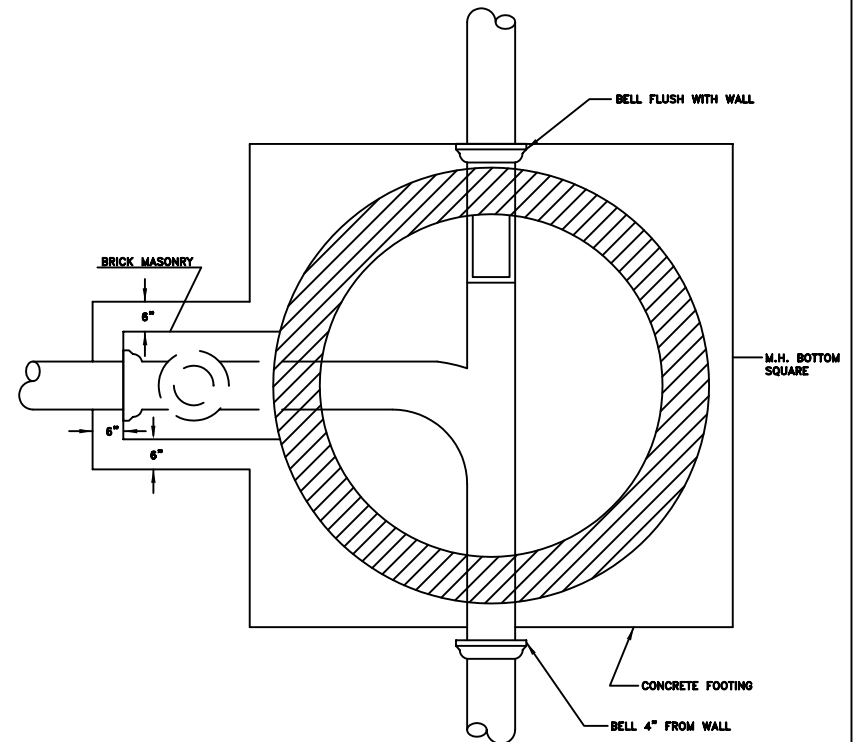


NOTE:

M.H.'S 8' OR LESS IN DEPTH TO HAVE 8" WALL THICKNESS

M.H.'S 8' TO 12' IN DEPTH TO HAVE 12" WALL THICKNESS

M.H.'S 12' TO 16' IN DEPTH TO HAVE 16" WALL THICKNESS



NOTE:

HARD SOUND COMMON BRICK TO BE LAID IN 1-3 CEMENT MORTAR, SHOVED JOINTS NOT TO EXCEED 3/8" THICK.

EXTERIOR FACES TO BE PLASTERED WITH 1-2 CEMENT MORTAR AND BITUMINOUS COATING.

6' x 6' x 6" - CONC. FOOTING REQ'D. FOR DEPTH TO 8'-0"

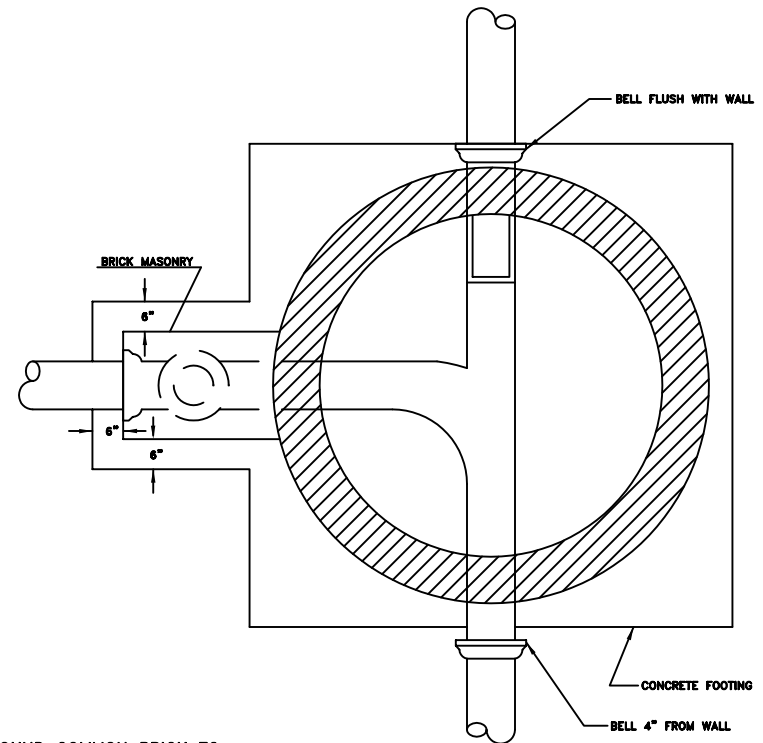
8' x 8' x 8" - CONC. FOOTING REQ'D. FOR DEPTH OVER 8'-0"

NO HAND-MIXED CONCRETE WILL BE ALLOWED ON THE JOB. ONLY READY-MIXED 3500# CONCRETE WILL BE USED.

STANDARD DROP MANHOLE

NO SCALE

C.S. 1A

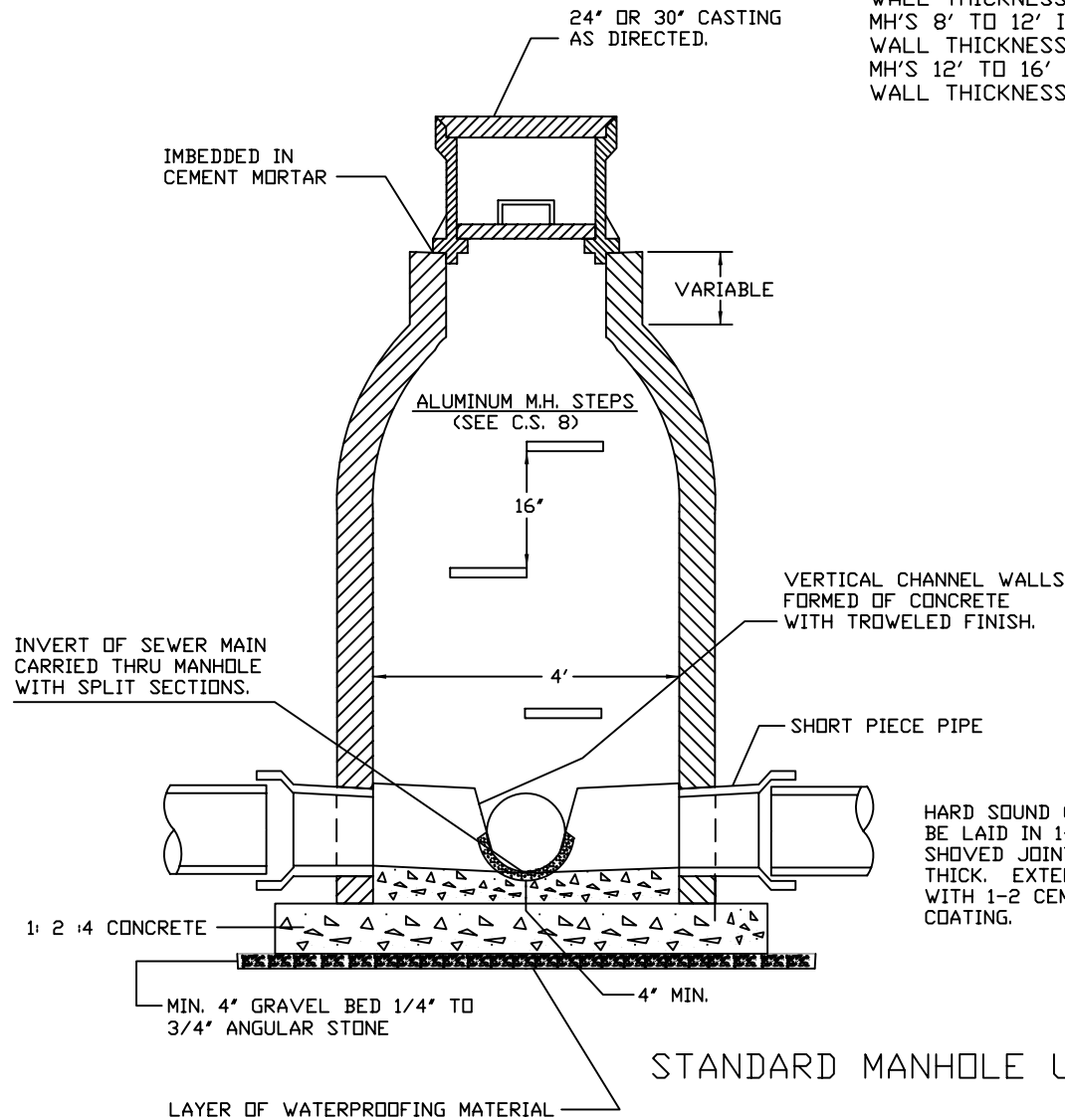


EXTERIOR FACES TO BE PLASTERED
WITH 1-2 CEMENT MORTAR AND
BITUMINOUS COATING.

NO HAND-MIXED CONCRETE WILL BE ALLOWED ON THE JOB. ONLY READY-MIXED 3500# CONCRETE WILL BE USED.

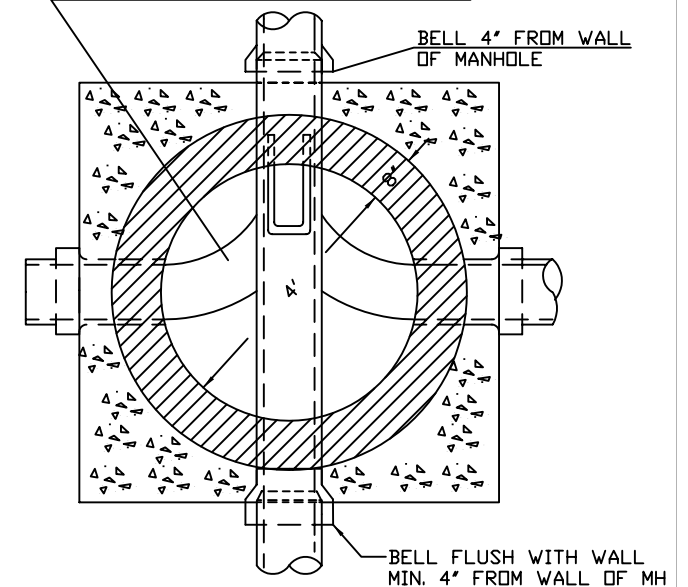
NO SCALE

NOTE:
 MH'S 9' OR LESS IN DEPTH TO HAVE 8"
 WALL THICKNESS
 MH'S 8' TO 12' IN DEPTH TO HAVE 12"
 WALL THICKNESS
 MH'S 12' TO 16' IN DEPTH TO HAVE 16"
 WALL THICKNESS



STANDARD MANHOLE USING V.C.E.S. PIPE

CHANNELS OF TRIBUTARIES
 TO BE FORMED OUT OF BRICK
 AND IN A CONTINUOUS CURVE,
 SURFACED WITH CEMENT MORTAR.

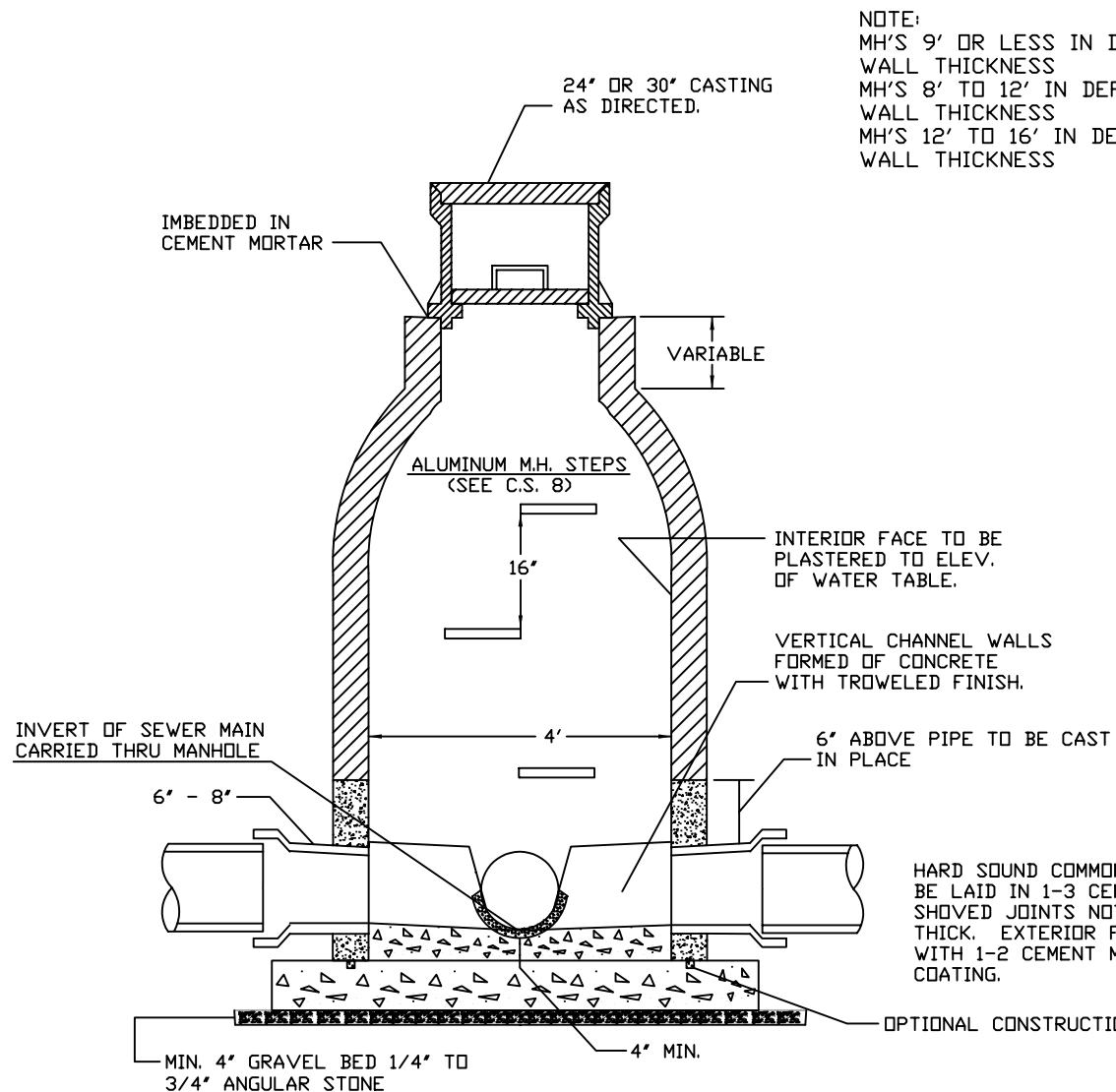


HARD SOUND COMMON BRICK TO
 BE LAID IN 1-3 CEMENT MORTAR.
 SHOVED JOINTS NOT TO EXCEED 3/8"
 THICK. EXTERIOR FACES TO BE PLASTERED
 WITH 1-2 CEMENT MORTAR & BITUMINOUS
 COATING.

NO HAND-MIXED CONCRETE WILL
 BE ALLOWED ON THE JOB.
 ONLY READY MIXED 3500#
 CONCRETE WILL BE USED.

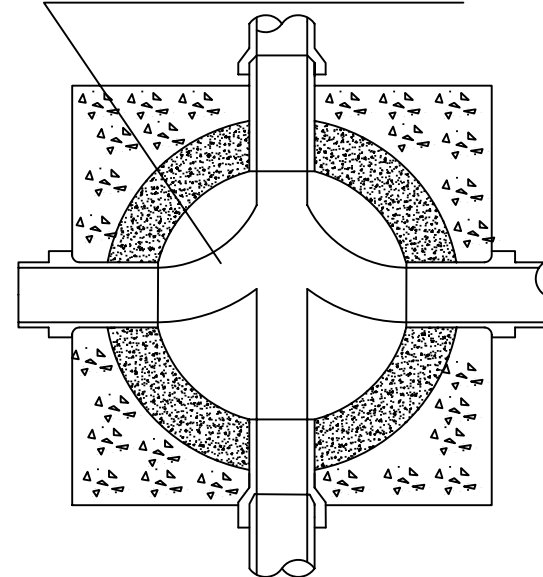
6' X 6' X 6' - CONC. FOOTING REQ'D.
 FOR DEPTH TO 8'-0"
 8' X 8' X 8' - CONC. FOOTING REQ'D.
 FOR DEPTH OVER 8'-0"

NO SCALE



NOTE:
MH'S 9' OR LESS IN DEPTH TO HAVE 8"
WALL THICKNESS
MH'S 8' TO 12' IN DEPTH TO HAVE 12"
WALL THICKNESS
MH'S 12' TO 16' IN DEPTH TO HAVE 16"
WALL THICKNESS

CHANNELS OF TRIBUTARIES
TO BE FORMED OUT OF BRICK
AND IN A CONTINUOUS CURVE,
SURFACED WITH CEMENT MORTAR.



HARD SOUND COMMON BRICK TO
BE LAID IN 1-3 CEMENT MORTAR.
SHOVED JOINTS NOT TO EXCEED 3/8"
THICK. EXTERIOR FACES TO BE PLASTERED
WITH 1-2 CEMENT MORTAR & BITUMINOUS
COATING.

NO HAND-MIXED CONCRETE WILL
BE ALLOWED ON THE JOB.
ONLY READY MIXED 3500#
CONCRETE WILL BE USED.

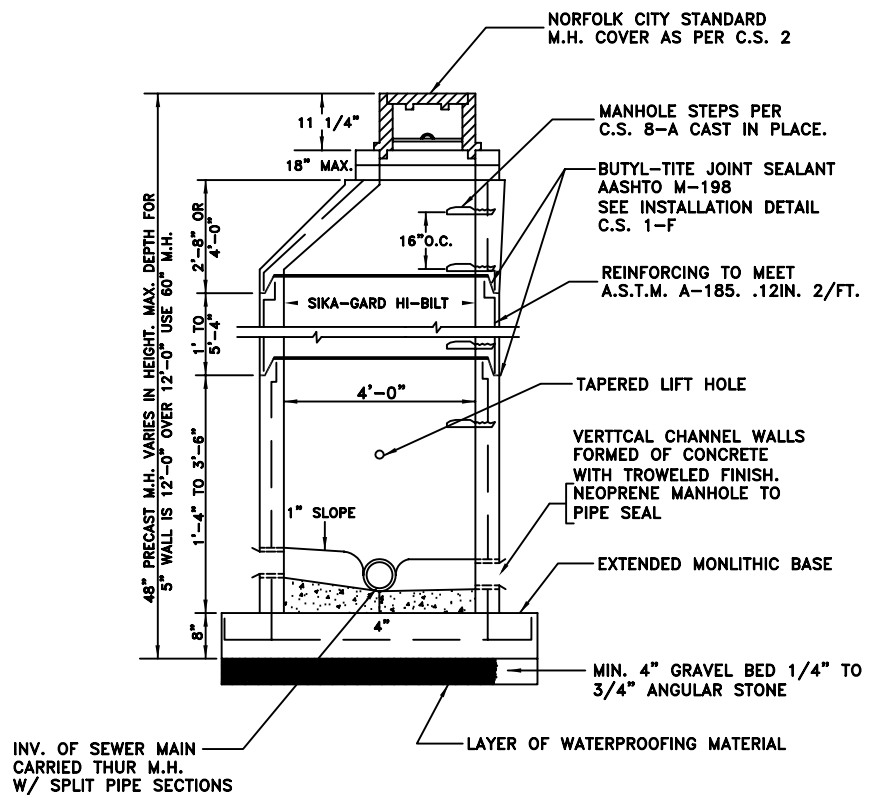
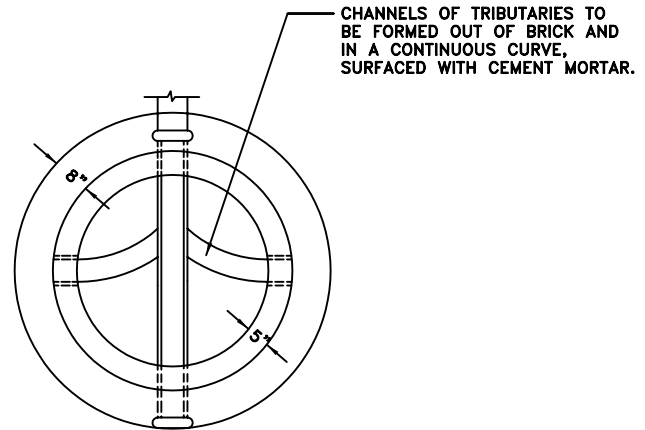
STANDARD M.H. USING C.I./D.I. PIPE

NO SCALE

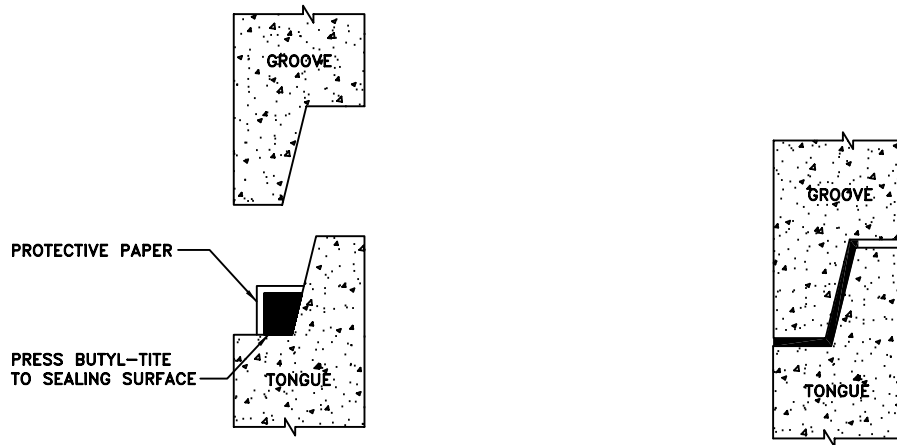
CITY OF NORFOLK VA. – STD. PRECAST SEWER MANHOLE

REQUIREMENTS

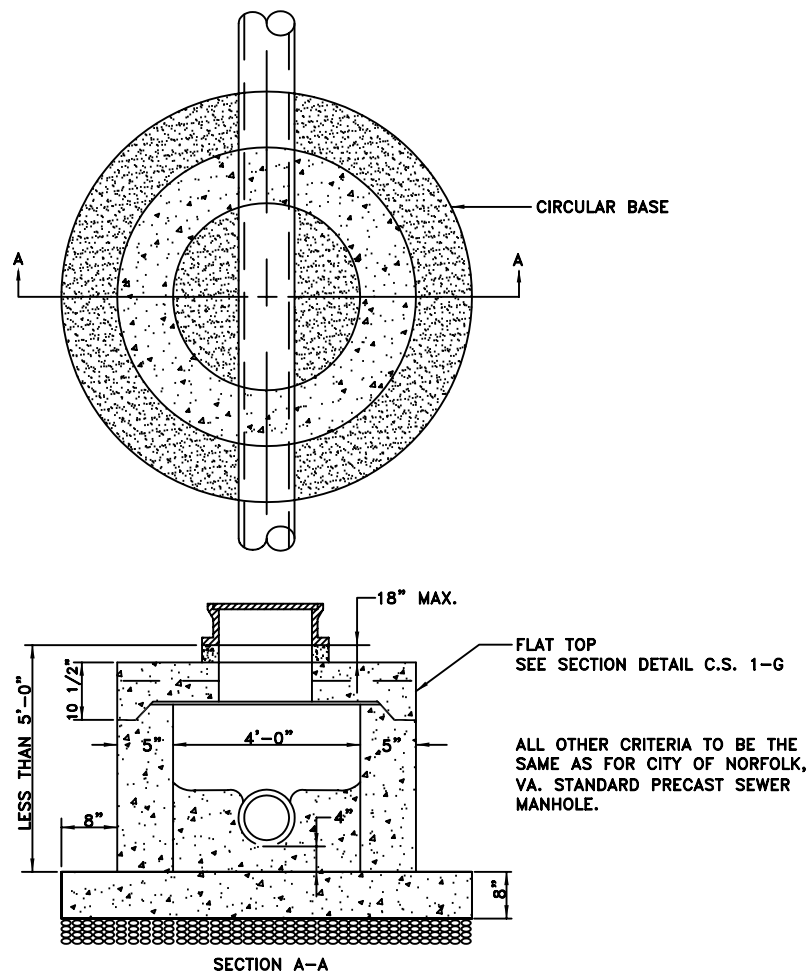
1. MANHOLE SHALL MEET ALL REQUIREMENTS OF ASTM C-478-72
2. BUTYL-TITE JOINT SEALANT SHALL MEET ALL REQUIREMENTS OF AASHTO M-198 OR APPROVED EQUAL.
3. CONCRETE SHALL HAVE MIN. COMPRESIVE STRENGTH OF 4,000 P.S.I.
4. REINFORCING FABRIC SHALL MEET ASTM A-185-72
5. BASES SHALL BE EXTENDED MONOLITHIC TYPE.
6. MAX. HEIGHT FOR 48" M.H. SHALL NOT EXCEED 12'. OVER 12' SHALL BE 60" M.H. UP TO 16'.
7. ALL MANHOLES SHALL RECEIVE INSIDE APPLICATION OF SIKAGARD HI-BILT OR APPROVED EQUAL APPLIED ACCORDING TO MANUFACTURERS SPEC'S.
8. MANHOLE STEPS SHALL BE AS PER CITY STANDARD C.S. 8-A
9. STANDARD INVERT ELEV. OF NO GREATER THAN 1' DIFFERENCE SHOULD BE DESIGN CRITERIA. IF GREATER THAN 2' M.H. MUST BE 60" DIA. INSIDE DROP CONNECTION.
10. CONTRACTOR MUST USE NEOPRENE SEAL MFG. TO A.S.T.M. C-443, (AS MFG. BY N.P.S.C., NASHUA N.H.) OR APPROVED EQUAL.



CITY OF NORFOLK, VA. PRECAST SEWER MANHOLE

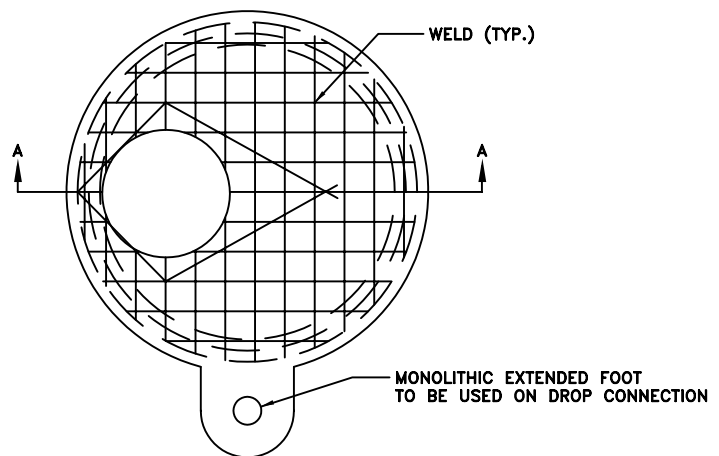
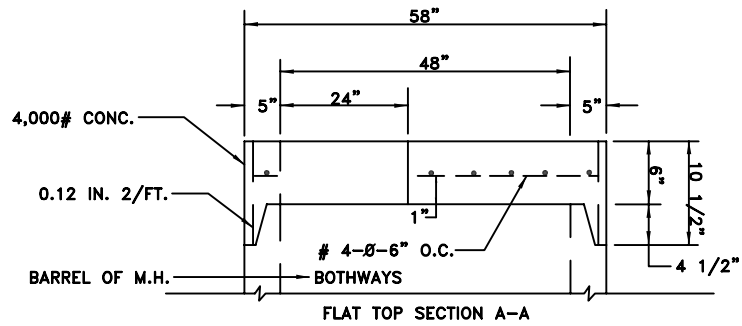


DETAIL: BUTYL - TITE JOINT SEALANT INSTALLATION NO SCALE



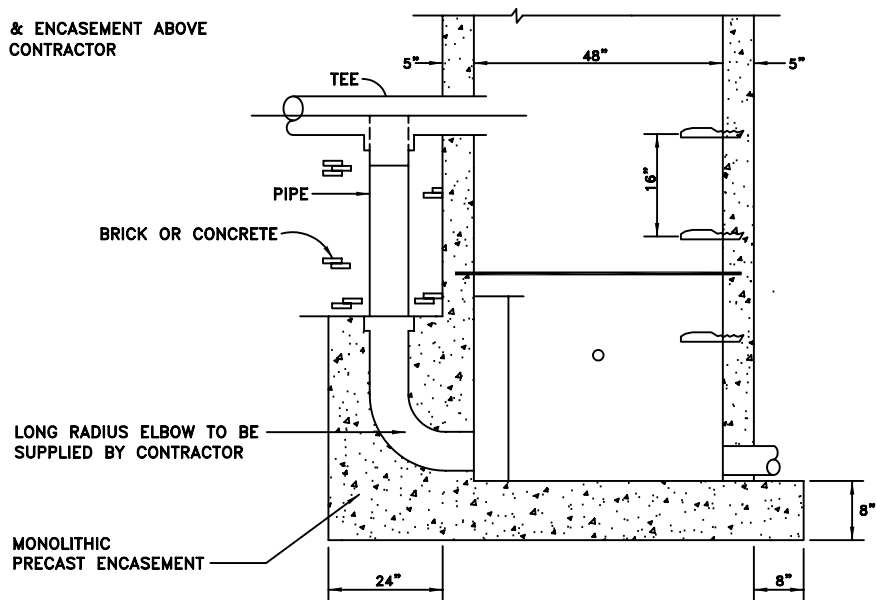
DETAIL: SHALLOW PRECAST SEWER MANHOLE NO SCALE
FOR MANHOLES LESS THAN 5'-0" TO TOP OF ADJUSTMENT

CITY OF NORFOLK – STD. PRECAST MANHOLE

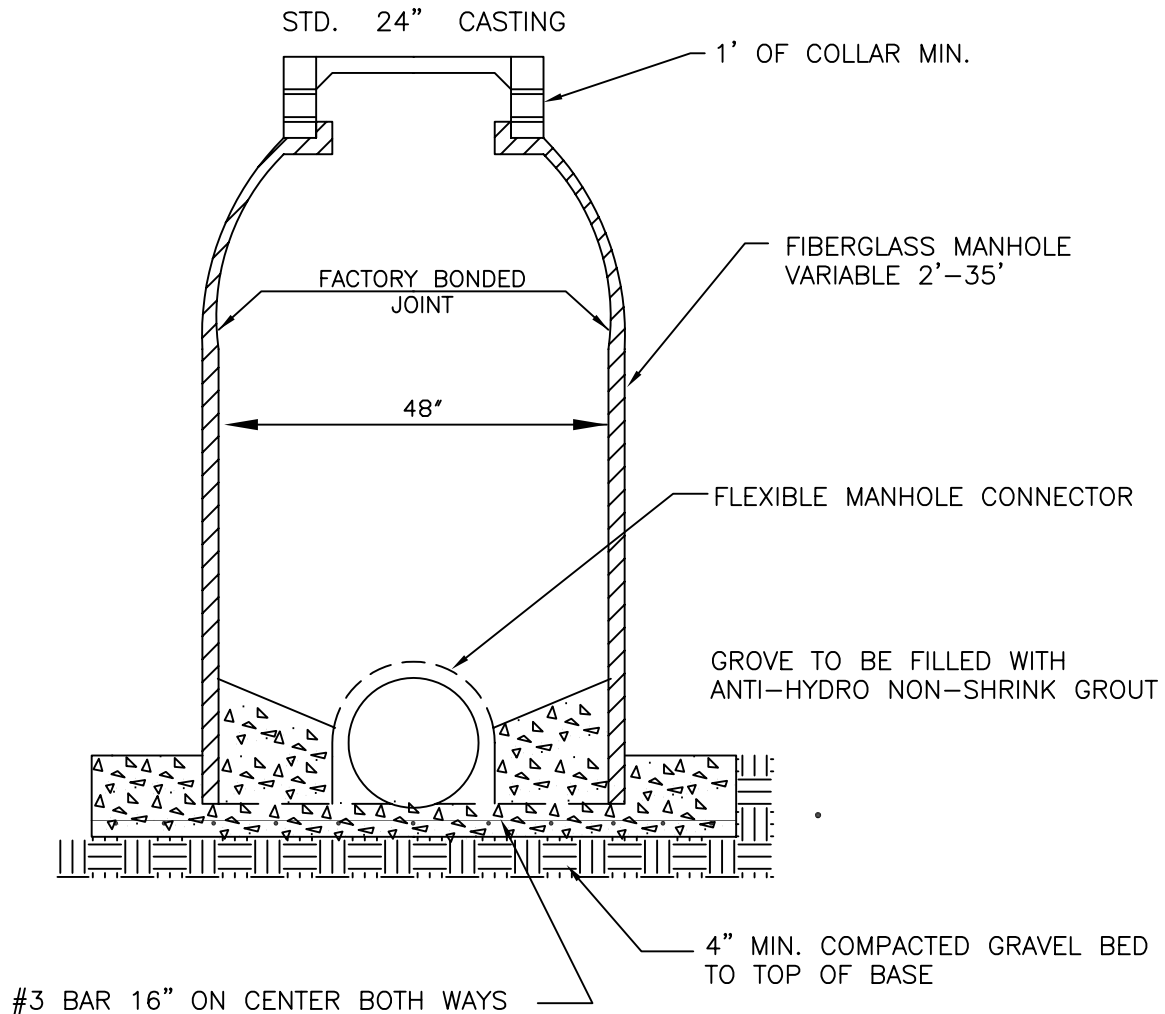


NOTE:

PIPE, TEE. & ENCASEMENT ABOVE
ELBOW BY CONTRACTOR



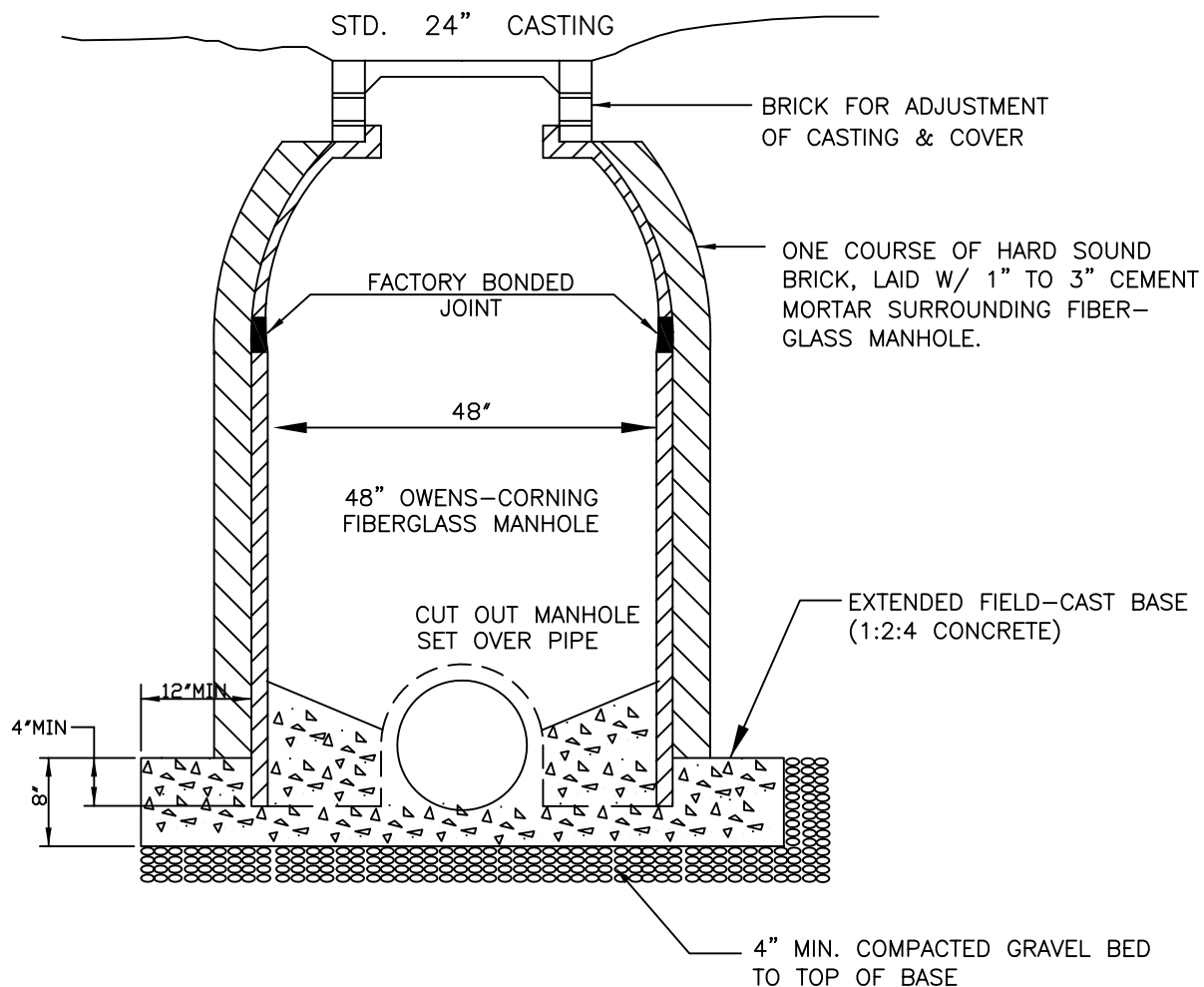
FIBERGLASS MANHOLE



NOTES:

STANDARD INSTALLATION OWENS CORNING FLOWTITE MANHOLE.

1. CONCRETE 4000 PSI 20 DAYS
2. ANTI-HYDRO NON-SHRINK GROUT OR APPROVED EQUAL TO BE USED IN 4" SEATING GROOVE.
3. MINIMUM OF 1' OF PRE-CAST CONCRETE OR BRICK AND MORTAR COLLAR TO BE USED UNDER CASTING
4. BENCH, JOINTS & MISC. PATCHING SHALL BE DONE WITH CALCIUM ALUMINATE CEMENT, FIELD MIXED.



INTERIOR PATCH WORK
BENCHES & INVERT TO
BE FORMED W/ CALCIUM
ALUMINATE CONCRETE
(FIELD MIXED) EQUAL
TO "FONDU" (BY LONE
STAR IND.).

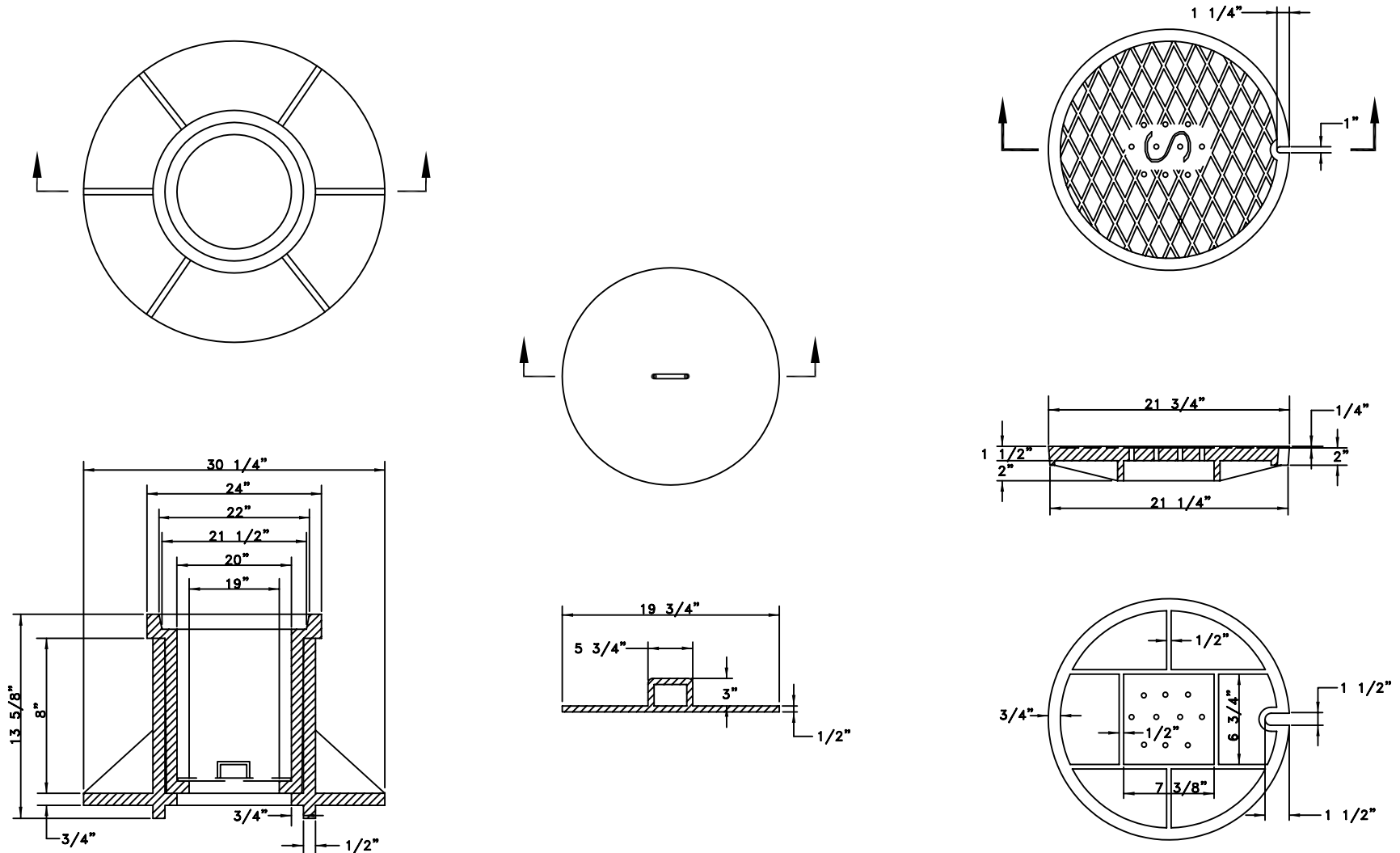
NOTES:

1. FIBERGLASS MANHOLE TO BE FIELD SET PLUMB IN BASE, WHILE BASE IS GREEN.
2. FIBERGLASS TO BE SET A MINIMUM OF 4" INTO BASE.
3. PIPE "CUT OUTS" TO BE FIELD CUT.

DETAIL: SPECIAL DISCHARGE MANHOLE

N.T.S.

CITY OF NORFOLK, VIRGINIA
DEPARTMENT OF UTILITIES



STANDARD ADJUSTABLE 24" MANHOLE CASTING & COVER

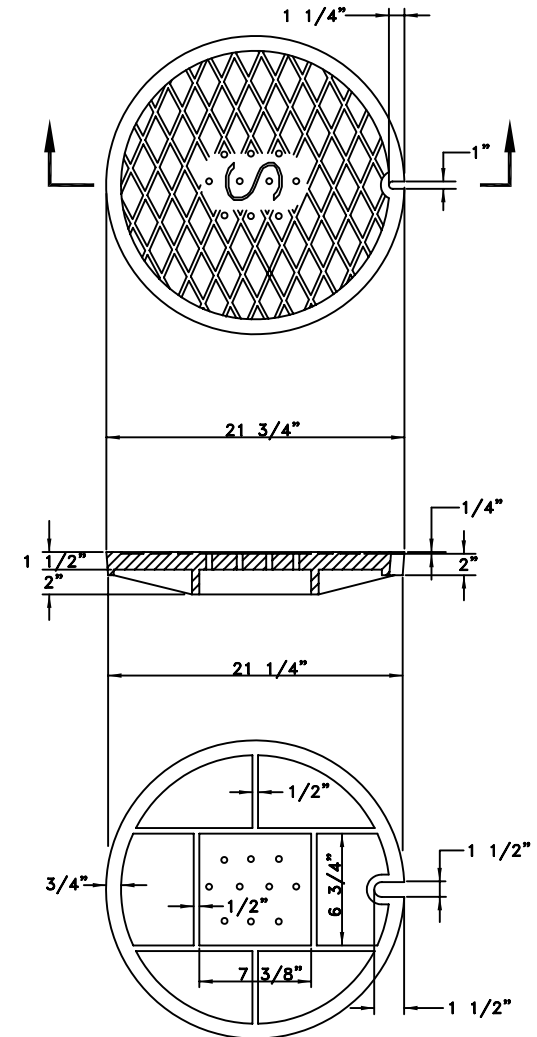
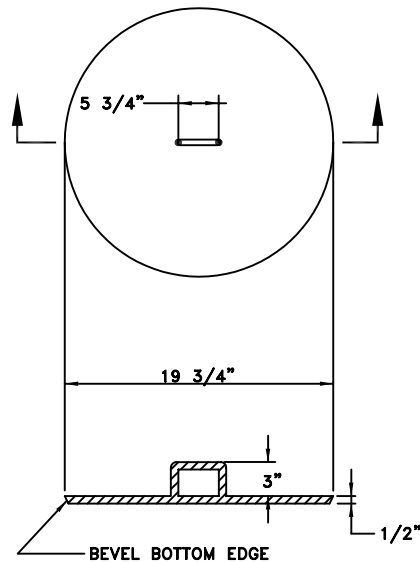
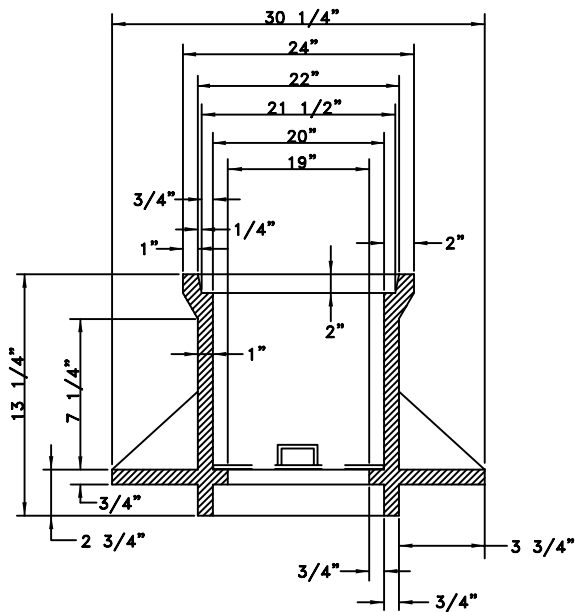
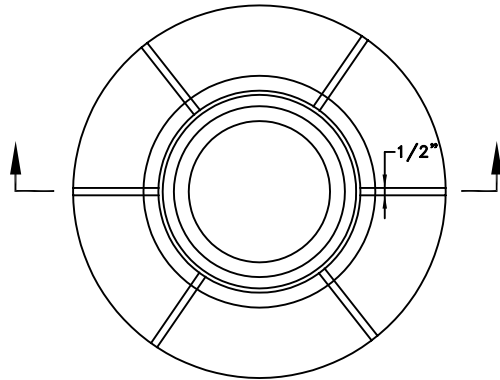
N.T.S.

CITY OF NORFOLK, VIRGINIA DEPARTMENT OF UTILITIES

GENERAL SPECIFICATIONS

1. CAST IRON SHALL BE 35,000 PSI.
2. TEST BARS SHALL BE PROVIDED.
3. A.S.T.M. SPECIFICATIONS A-48-60.
4. LARGE LETTER IN CENTER MAY BE S, W, OR D, AS SPECIFIED IN ORDER.
5. CASTING AND COVER IS TO BE MACHINED TO INSURE A FIRM TIGHT FIT.
6. WEIGHT SHALL BE PAINTED ON FRAME AND COVER.
7. WEIGHT:

FRAME -	320 lbs.
COVER -	166 lbs.
INNER COVER -	40 lbs.
TOTAL -	526 lbs.



STANDARD NON-ADJUSTABLE 24" MANHOLE CASTING & COVER

N.T.S.

C.S. 2A

CITY OF NORFOLK, VIRGINIA
DEPARTMENT OF UTILITIES

NOTES:

LARGE LETTER IN CENTER OF COVER MAY BE
S, W, OR D, AS SPECIFIED IN ORDER.

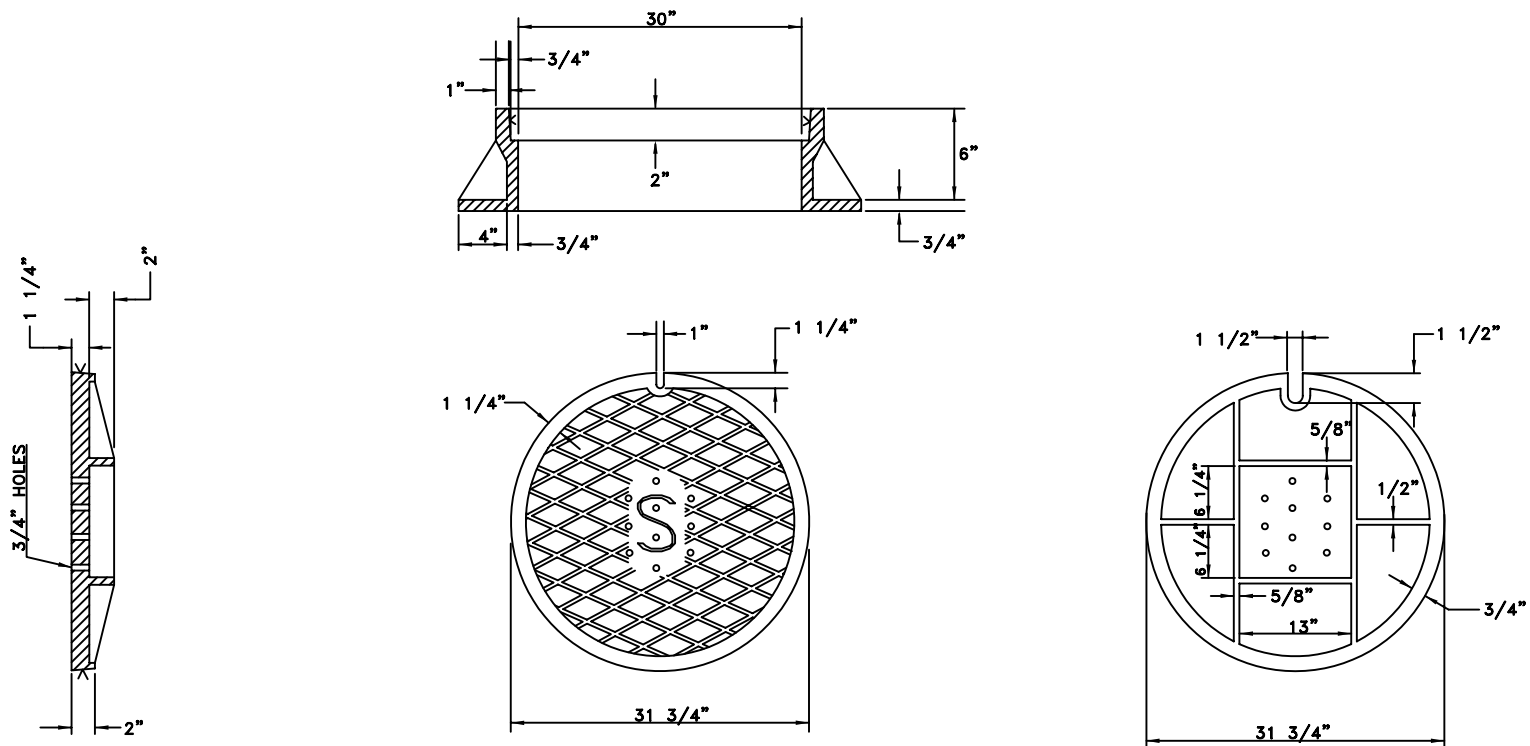
CAST IRON SHALL BE 35,000 P.S.I.
A.S.T.M. SPECS A-48-60

WEIGHT SHALL BE PAINTED ON FRAME AND TOP

WEIGHT

C.I. FRAME	250 LB.
C.I. COVER	<u>290 LB.</u>
TOTAL	540 LB.

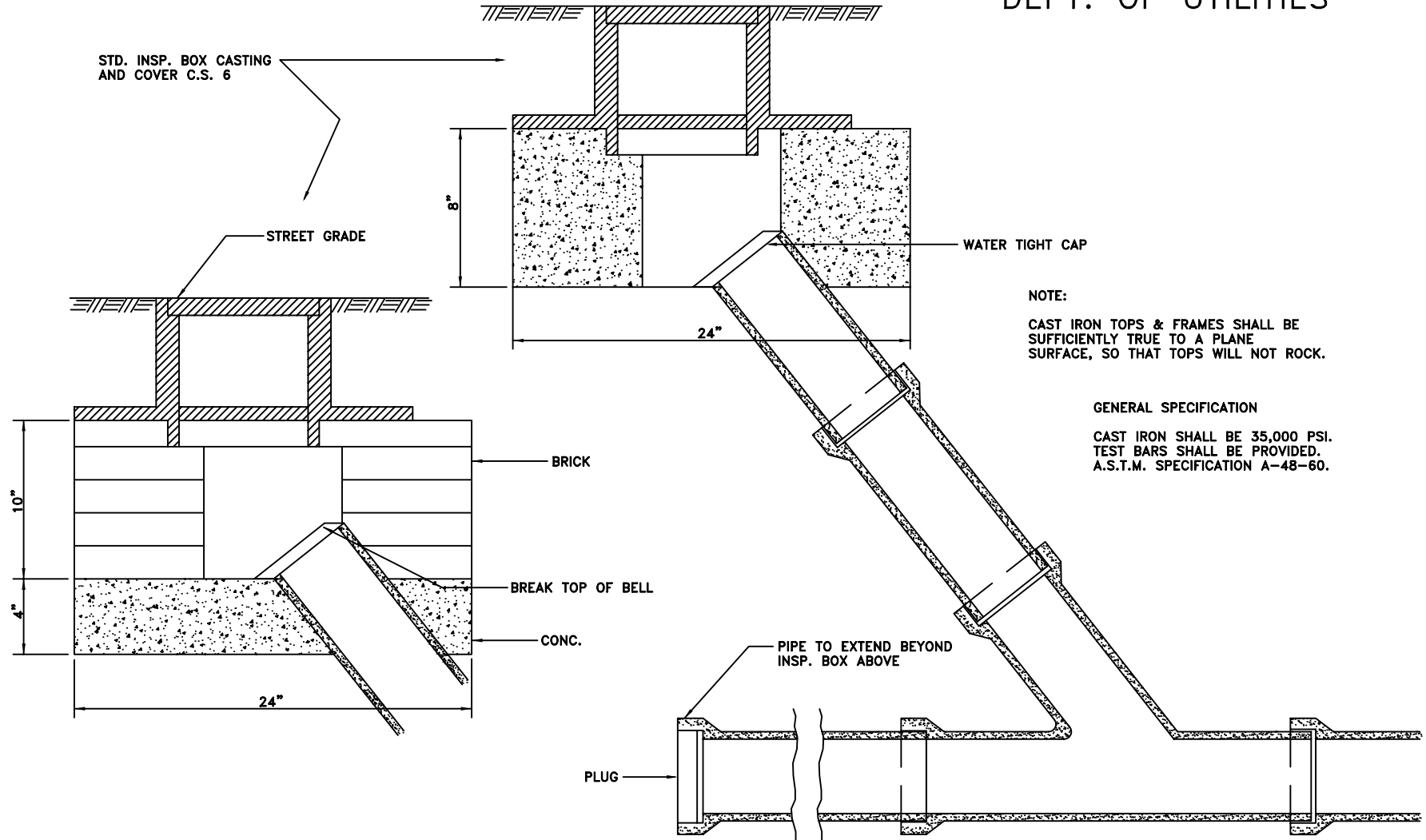
CASTING AND COVER IS TO BE MACHINED
TO INSURE A FIRM TIGHT FIT.



STANDARD 30" MANHOLE CASTING & COVER

N.T.S.

CITY OF NORFOLK, VA.
DEPT. OF UTILITIES

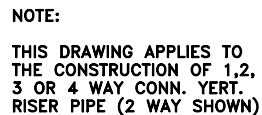


STANDARD CLEANOUT CONNECTION

N.T.S.

C.S. 3

CITY OF NORFOLK, VA.
DEPT. OF UTILITIES

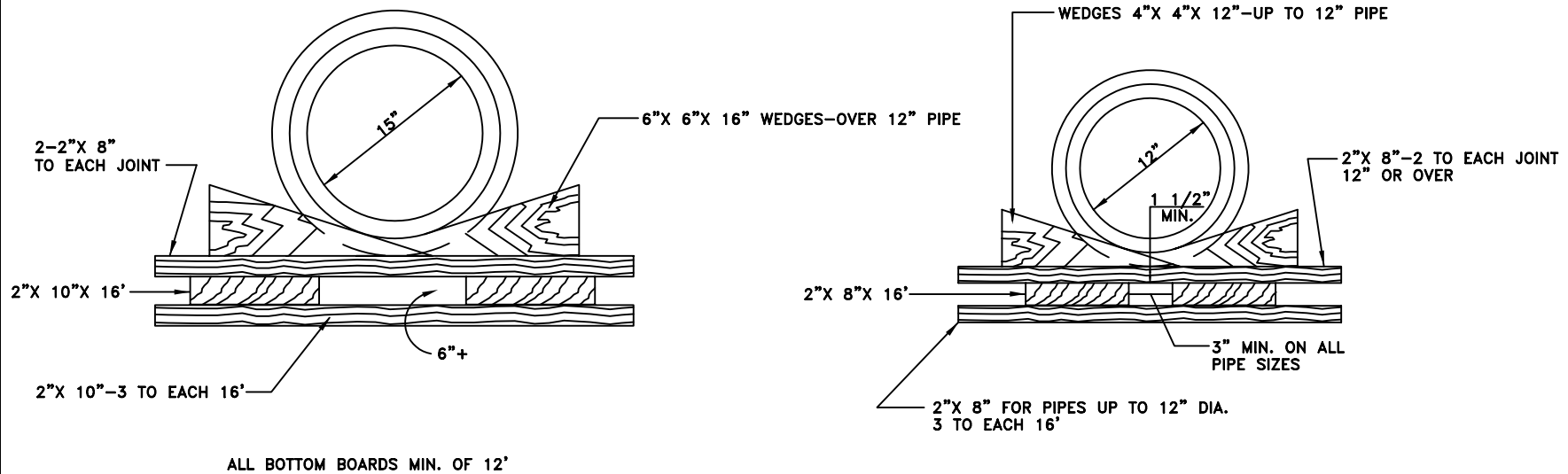


NO SCALE

CITY OF NORFOLK, VIRGINIA
DEPT. OF UTILITIES

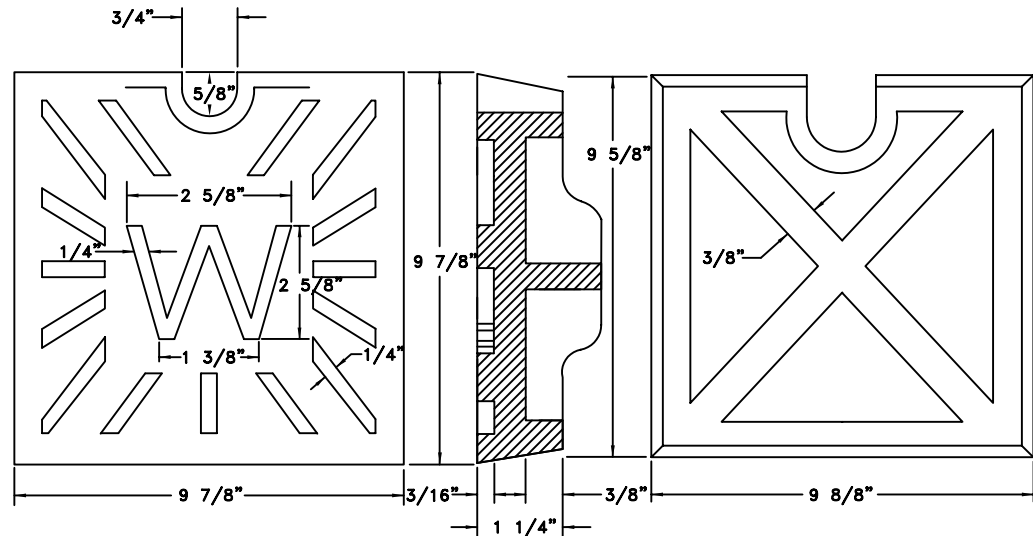
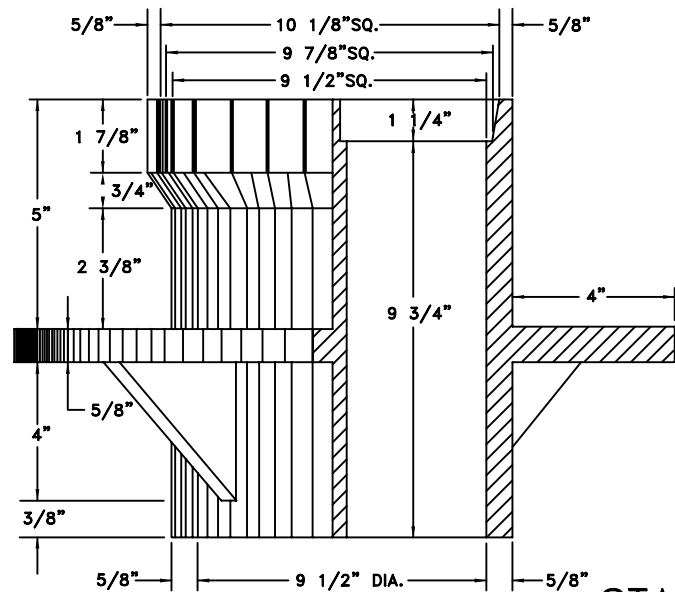
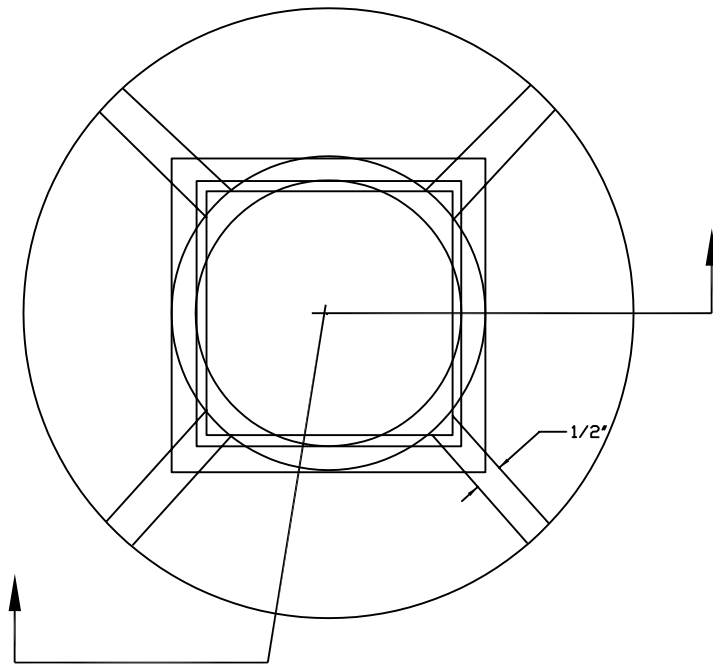
NOTE:

ALL LUMBER TO BE DRESSED PINE.



BOTTOM BOARD DETAILS

NO SCALE



NOTE:

LETTER ON COVER SHALL BE "S" WHEN
USED IN SAN. SEWER SYSTEM AND "W"
WHEN USED IN WATER SYSTEM.

GENERAL SPECIFICATIONS

1. CAST IRON SHALL BE 35,000 PSI
2. TEST BARS SHALL BE PROVIDED.
3. A.S.T.M. SPECIFICATIONS A-48-60.
4. WEIGHT SHALL BE PAINTED ON
FRAME AND COVER.

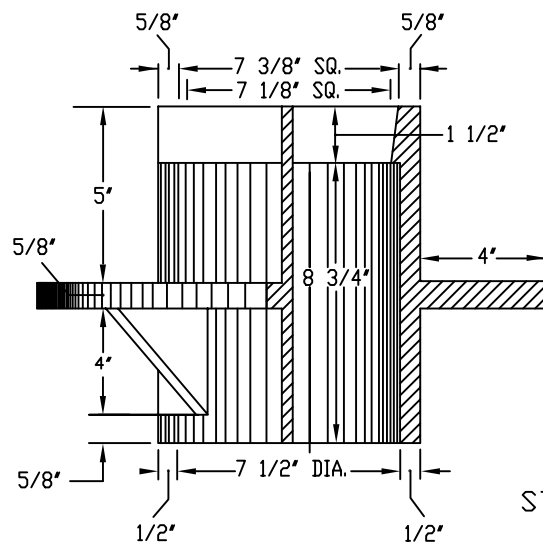
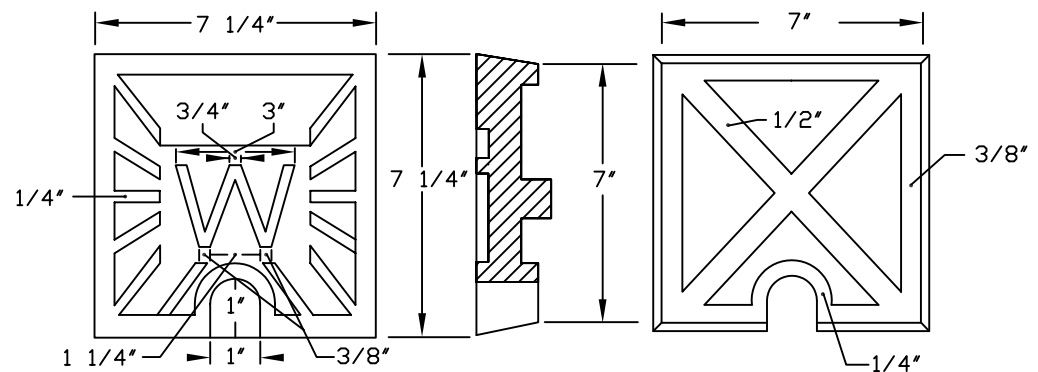
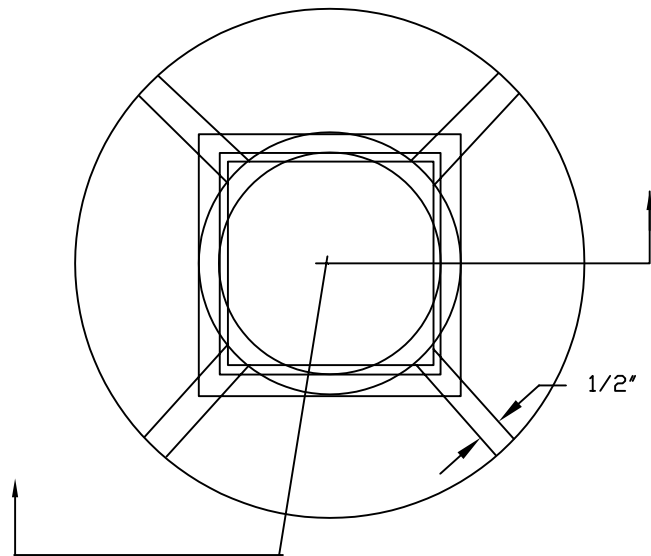
WEIGHT:

FRAME = 112 lbs.
COVER = 21 lbs.
TOTAL = 133 lbs.

STANDARD LARGE GATE VALVE BOX

NO SCALE

CITY OF NORFOLK, VIRGINIA
DEPT. OF UTILITIES



NOTE:

LETTER ON COVER SHOULD BE "S" WHEN
USED IN SAN. SEWER SYSTEM AND "W" WHEN
USED IN WATER SYSTEM.

GENERAL SPECIFICATIONS

1. CAST IRON SHALL BE 35,000 PSI.
2. TEST BARS SHALL BE PROVIDED.
3. WEIGHT SHALL BE PRINTED ON
FRAME AND COVER.
4. WEIGHT:
FRAME- 76lbs.
COVER- 14lbs.
TOTAL- 90lbs.

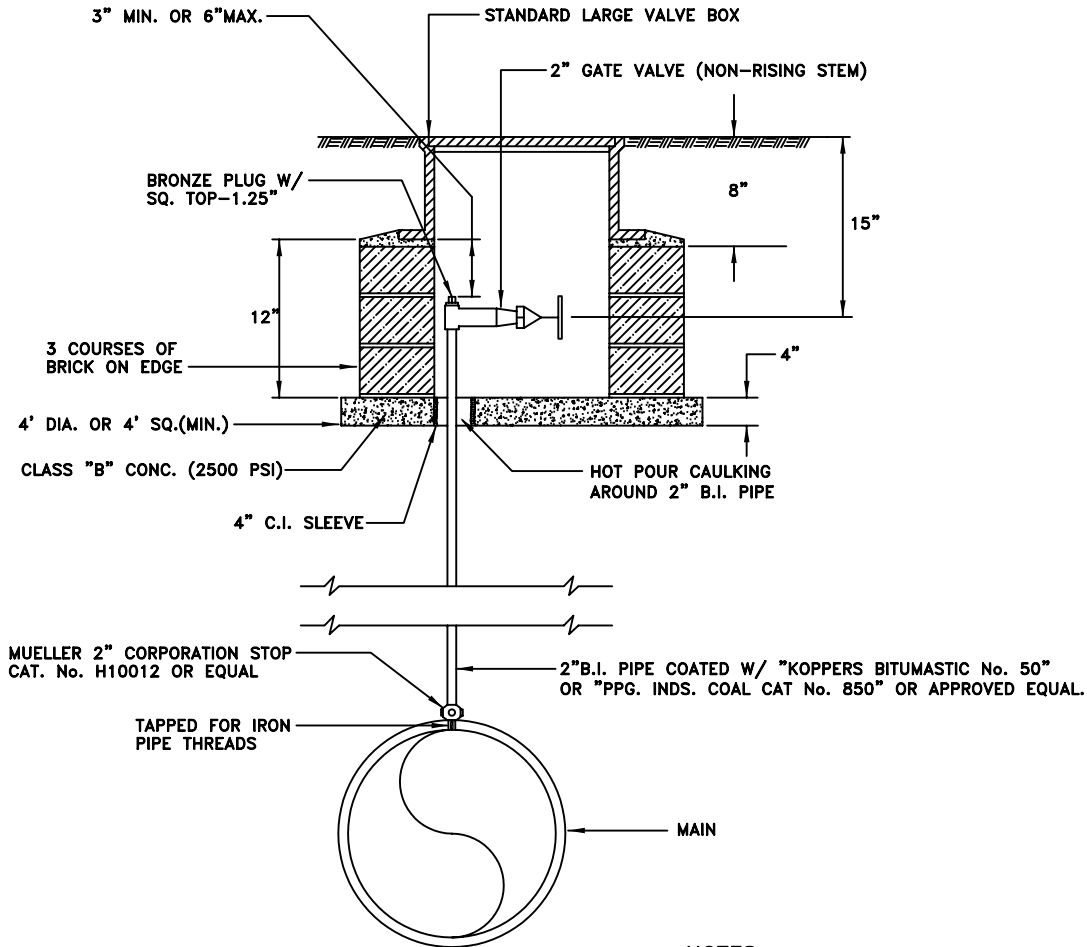
STANDARD SMALL GATE VALVE BOX

THIS DRAWING IS NOT TO SCALE

DRAWN: R.L. SPARKS MAY 1988

C.S. 5A

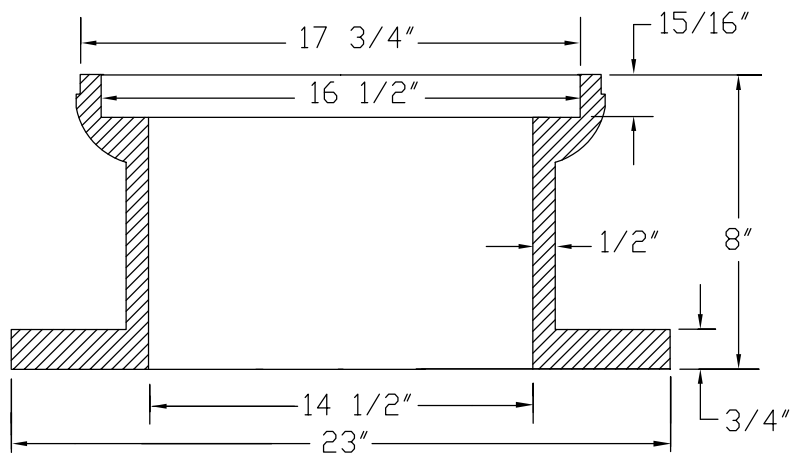
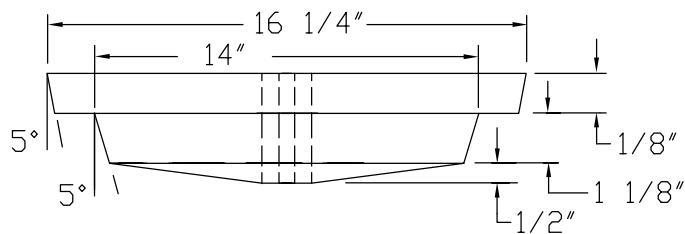
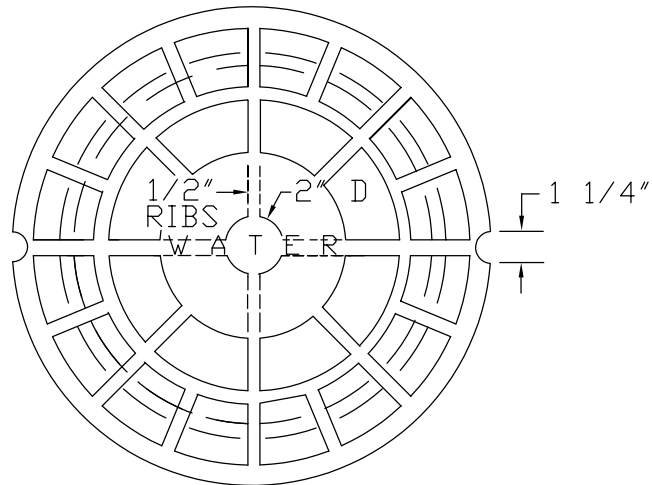
AIR VENT DETAIL



NOTES:

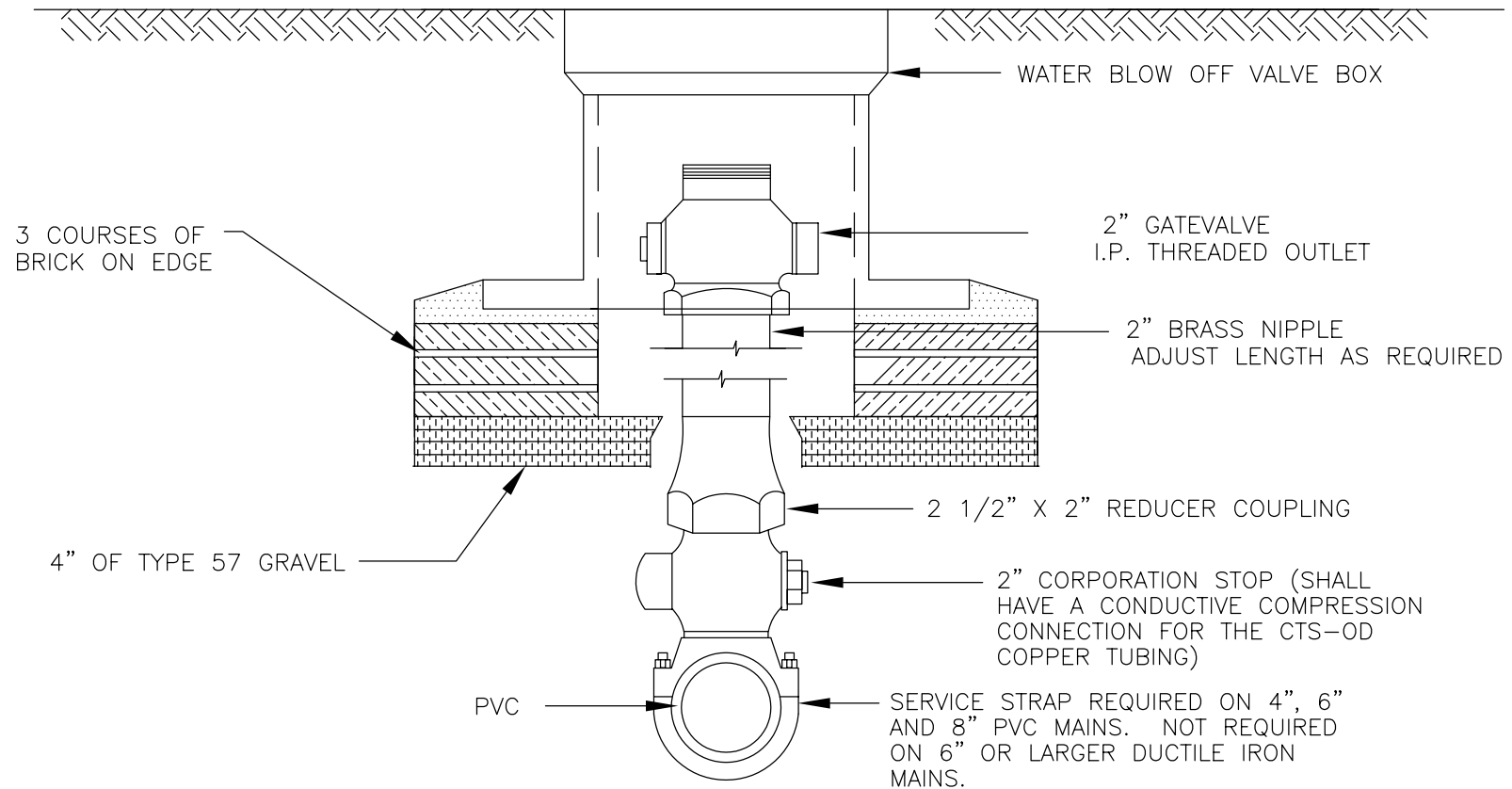
1. 2" TAP FOR AIR VENT SHALL BE STANDARD
THREADED TAP OR SADDLE TAP DEPENDING
ON MANUFACTURER'S RECOMMENDATION
FOR TYPE AND THICKNESS OF PIPE USED.
2. GRAVEL BEDDED MAY BE USED IN PLACE
OF CONCRETE IN NON-TRAFFIC AREA AT
DISCRETION OF ENGINEER.
3. B.I. = BLACK IRON/GALVANIZED PIPE.
4. MACHINE SEATING SURFACES ON BOTH COVER &
FRAME.
5. ALL CASTING TO BE DIPPED IN ASPHALTIC PAINT
AFTER MACHINING.
6. TOLERANCE TO BE + .125" FOR ALL DIMENSIONS.
7. CASTING TO BE SHOT BLASTED.
8. CASTING TO BE ASTM A-48 CLASS 30.

WATER BLOW-OFF
VALVE BOX



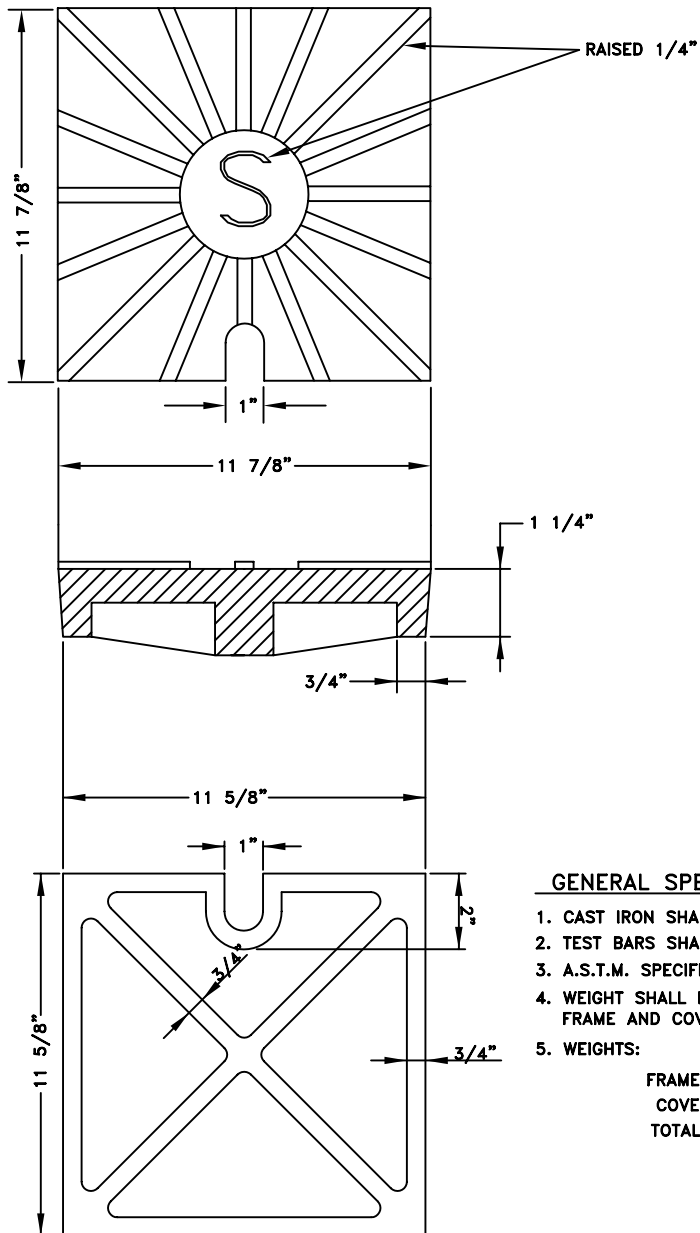
NOTES

1. ALL DIMENSIONS ARE IN INCHES
FIGURE NOT TO SCALE.
2. MACHINE ALL SEATING SURFACES
ON BOTH COVER & FRAME.
3. ALL CASTINGS TO BE DIPPED IN
ASPHALTIC PAINT AFTER
MACHINING
4. TOLERANCE TO BE .125" FOR
ALL DIMENSIONS
5. CASTING TO BE SHOT BLASTED.
6. CASTING TO BE ASTM A-48
CLASS 30.
7. C.I. FRAME AND COVER TO BE
RICHARD FOUNDRY CORP. B-1200
OR EQUAL.



2" BLOW OFF VALVE

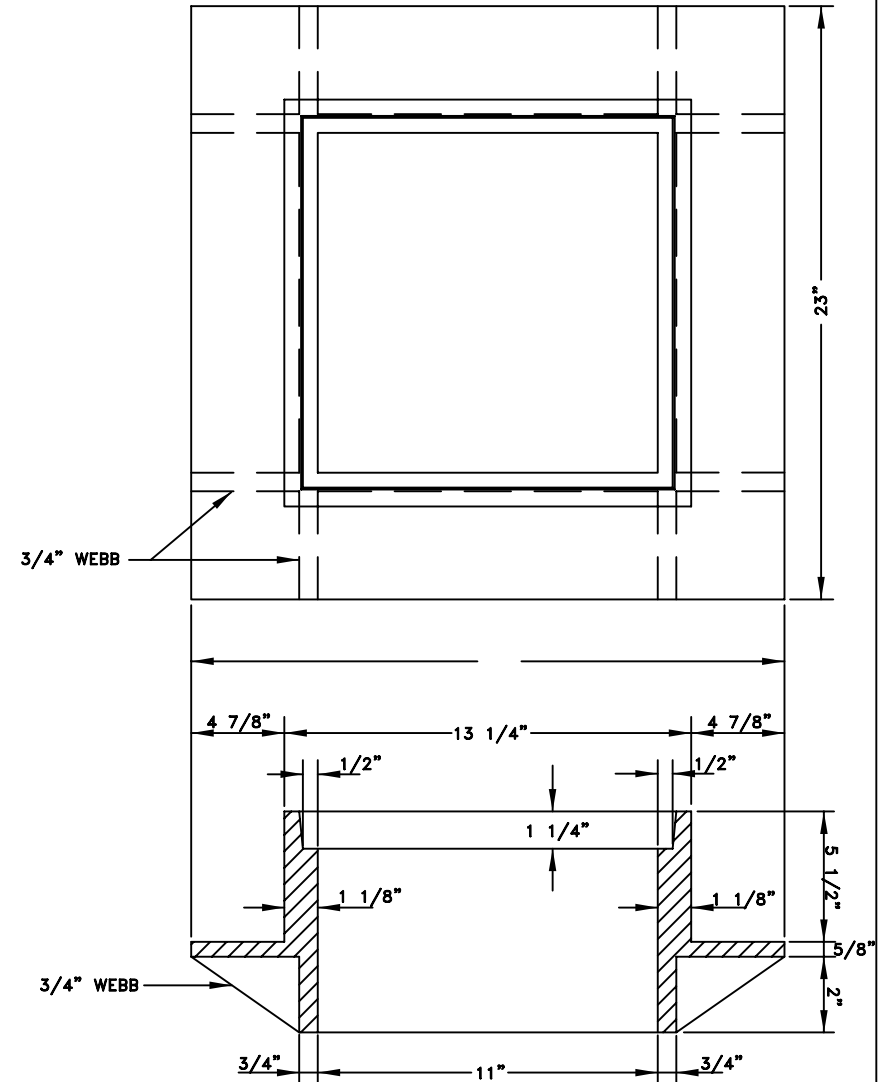
CITY OF NORFOLK, VA.
DEPT. OF UTILITIES



GENERAL SPECIFICATIONS

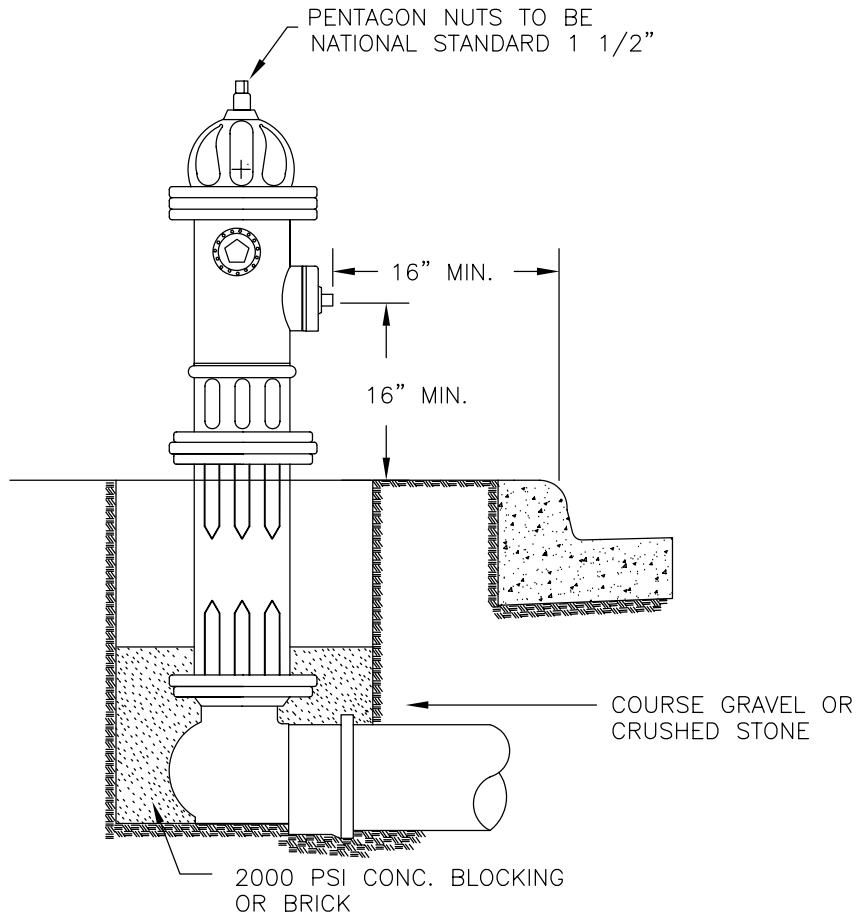
1. CAST IRON SHALL BE 35,000 PSI.
2. TEST BARS SHALL BE PROVIDED.
3. A.S.T.M. SPECIFICATIONS A-48-60.
4. WEIGHT SHALL BE PAINTED ON FRAME AND COVER.
5. WEIGHTS:

FRAME = 152 lbs.
COVER = 30 lbs.
TOTAL = 182 lbs.



STANDARD INSPECTION BOX CASTING & COVER

NOT TO SCALE



1. HYDS. TO BE SET WITH BURY LINE POSITIONED AT GRADE WITH NOZZLES AT MIN. OF 16 INCHES ABOVE GROUND.
2. WHEN SET BEHIND CURB THE NOZZLES ARE TO BE PARALLEL OR AT RIGHT ANGLES TO THE CURB, WITH THE PUMPER NOZZLE FACING THE CURB. THE PUMPER NOZZLE WILL BE A MIN. DISTANCE OF 16 INCHES FROM THE FACE OF THE CURB.
3. BOWL OF THE HYD. TO BE BLOCKED AGAINST UNDISTURBED EARTH WITH 2000 PSI CONCRETE OR BRICKS, OR AS DIRECTED BY ENGINEER.
4. WHEN THE HYD. IS SET IN PERVIOUS SOIL COARSE GRAVEL OR CRUSHED STONE IS TO BE PLACED FROM THE BOTTOM OF THE TRENCH TO AT LEAST 6 INCHES ABOVE THE DRAIN OPENINGS IN THE HYD. AND AT A DISTANCE OF ONE FOOT AROUND THE ELBOW.

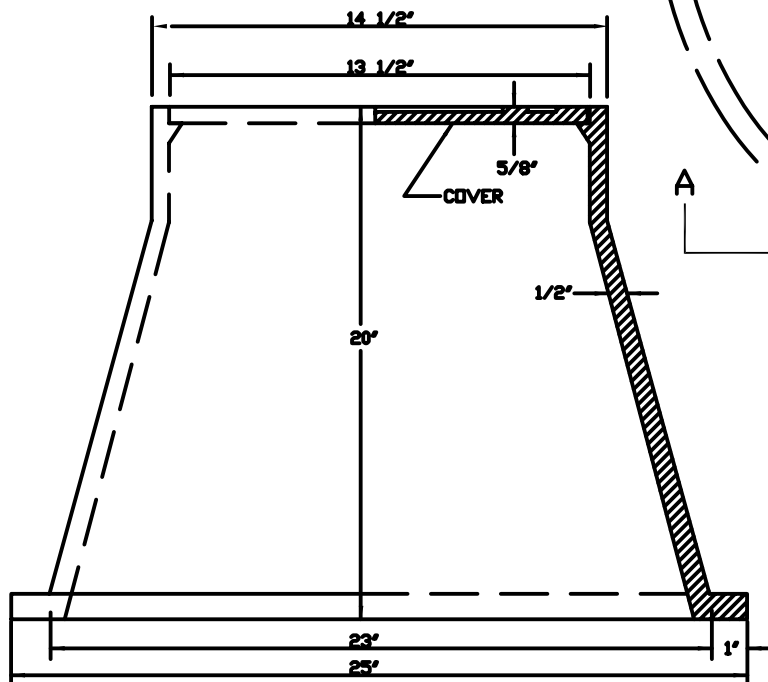
FIRE HYDRANT INSTALLATION DETAIL

CITY OF NORFOLK, VA.
DEPT. OF UTILITIES

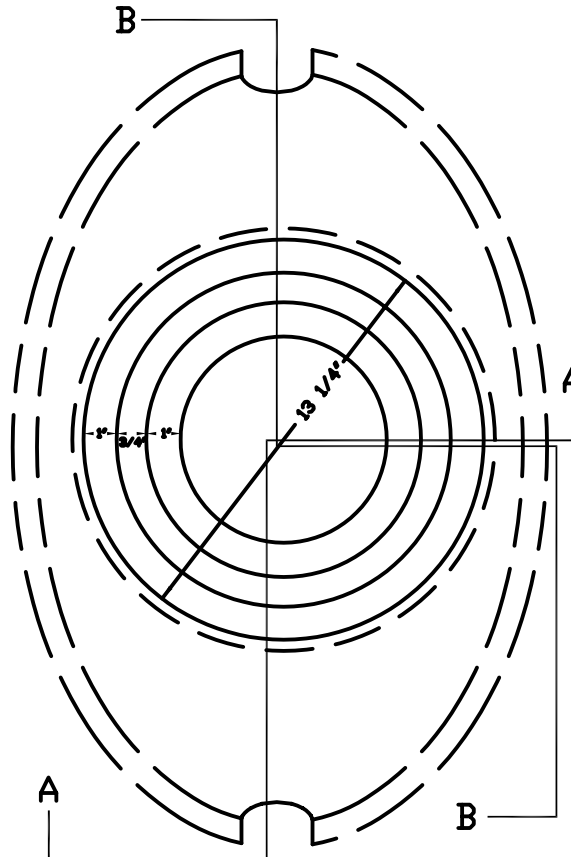
LARGE SIZE METER BOX AND COVER

GENERAL SPECIFICATIONS

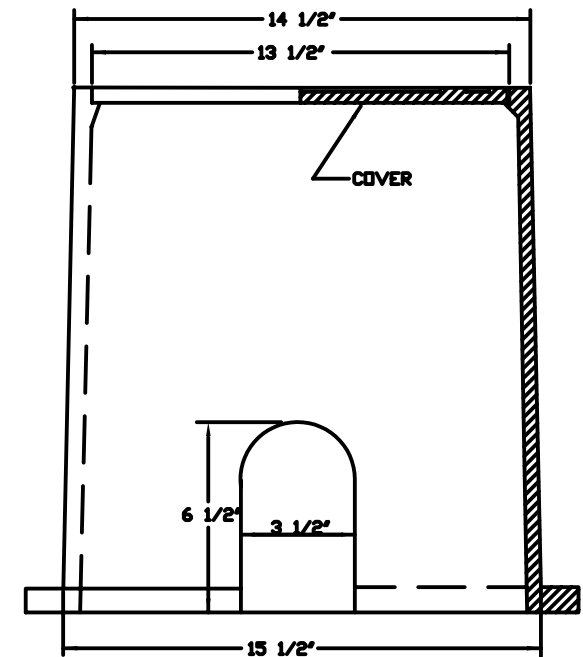
1. CAST IRON SHALL BE 35,000 P.S.I.
2. ASTM SPECS. A 48.60
3. WEIGHT SHALL BE PAINTED ON FRAME AND COVER



SECTION "B-B"



NO SCALE



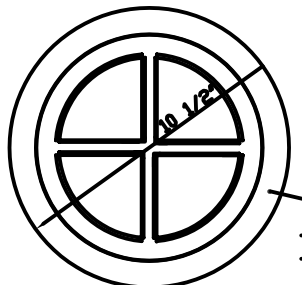
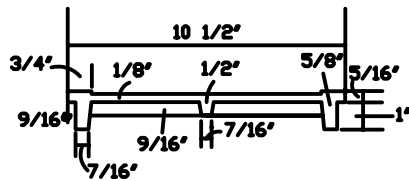
SECTION "A-A"

CITY OF NORFOLK, VA. DEPT. OF UTILITIES

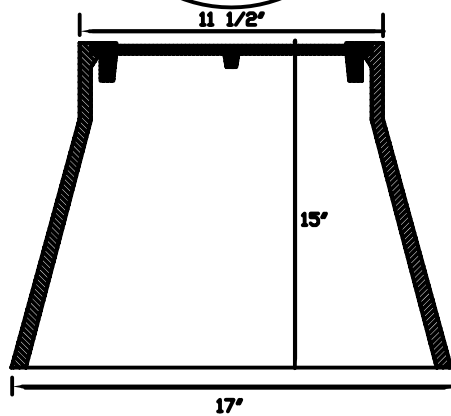
GENERAL SPECIFICATIONS

1. CAST IRON SHALL BE 35,000 P.S.I.
2. ASTM SPECS. A 48.60
3. WEIGHT SHALL BE PAINTED ON FRAME AND COVER

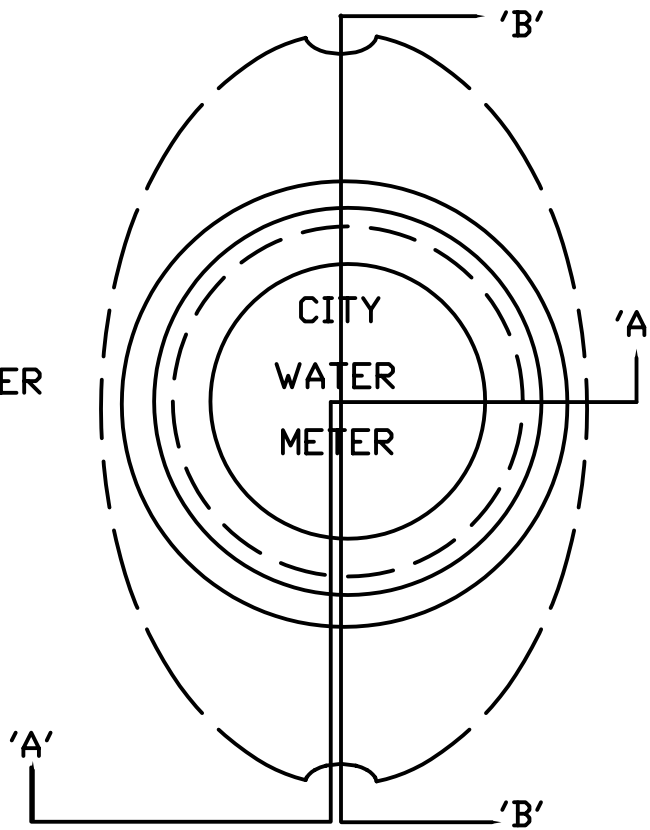
SECTION "BB"



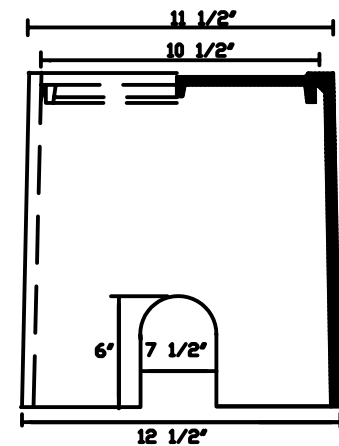
BOTTOM COVER



COVER-SMALL BOX

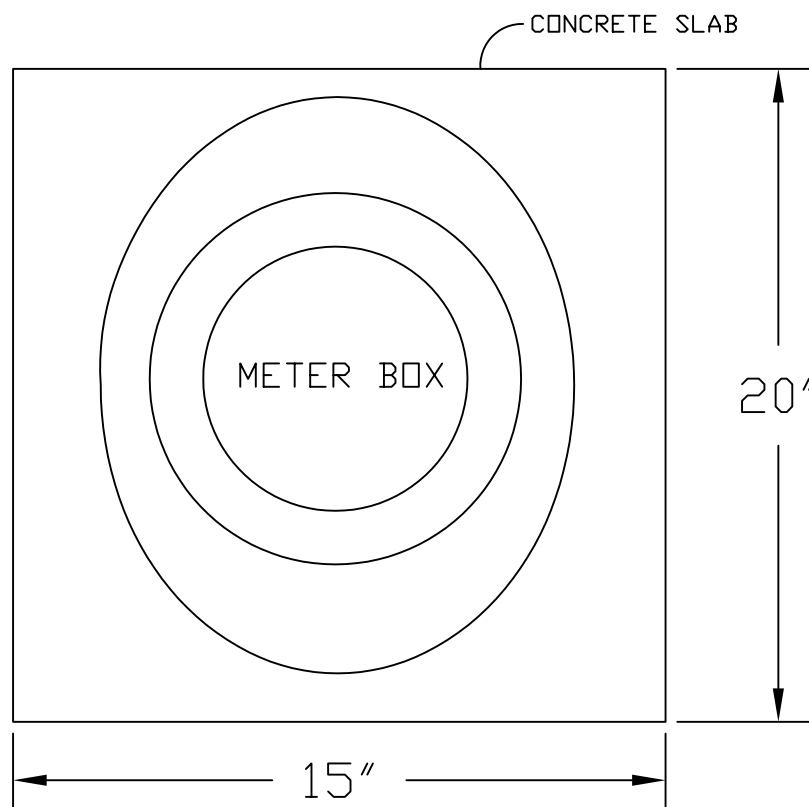
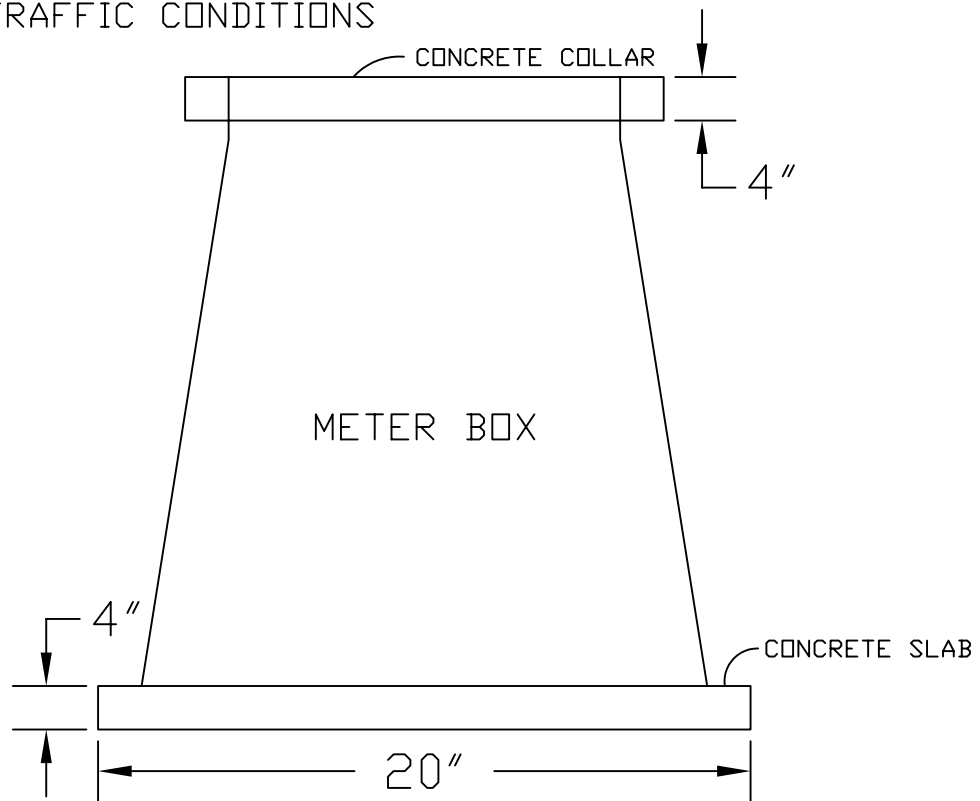


SECTION "AA"

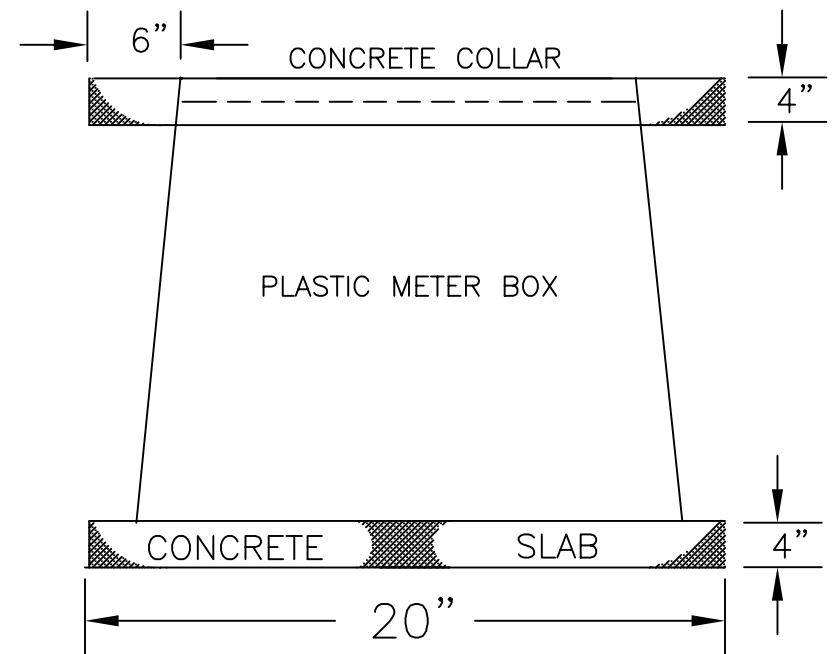
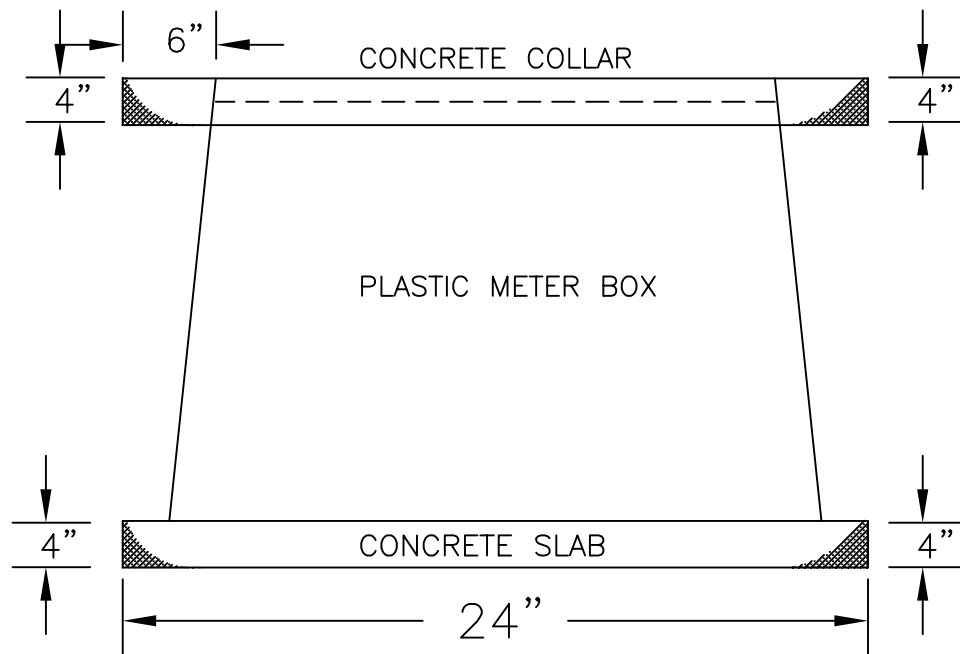


NO SCALE

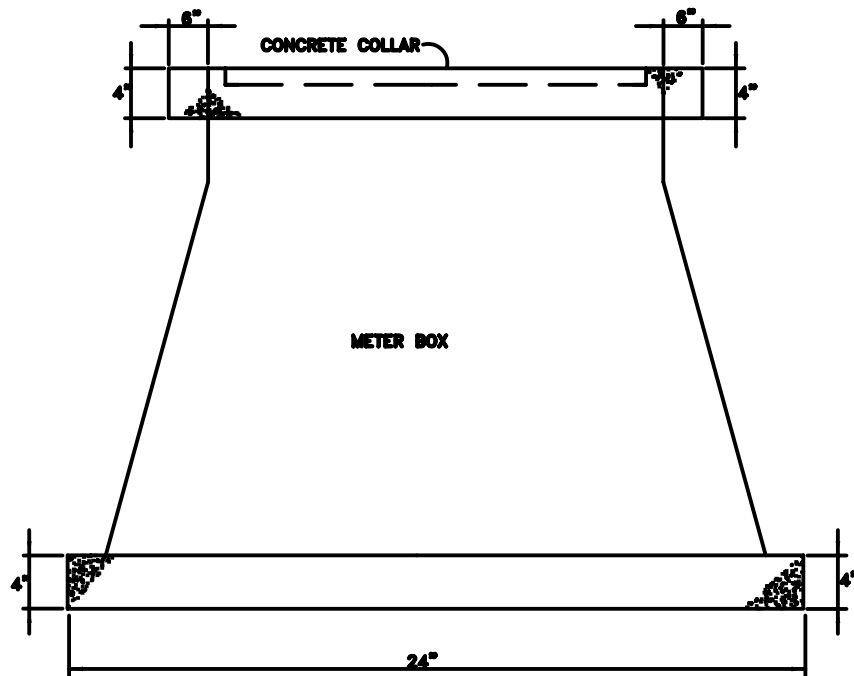
SMALL METER BOX
CONCRETE REINFORCEMENT
TRAFFIC CONDITIONS



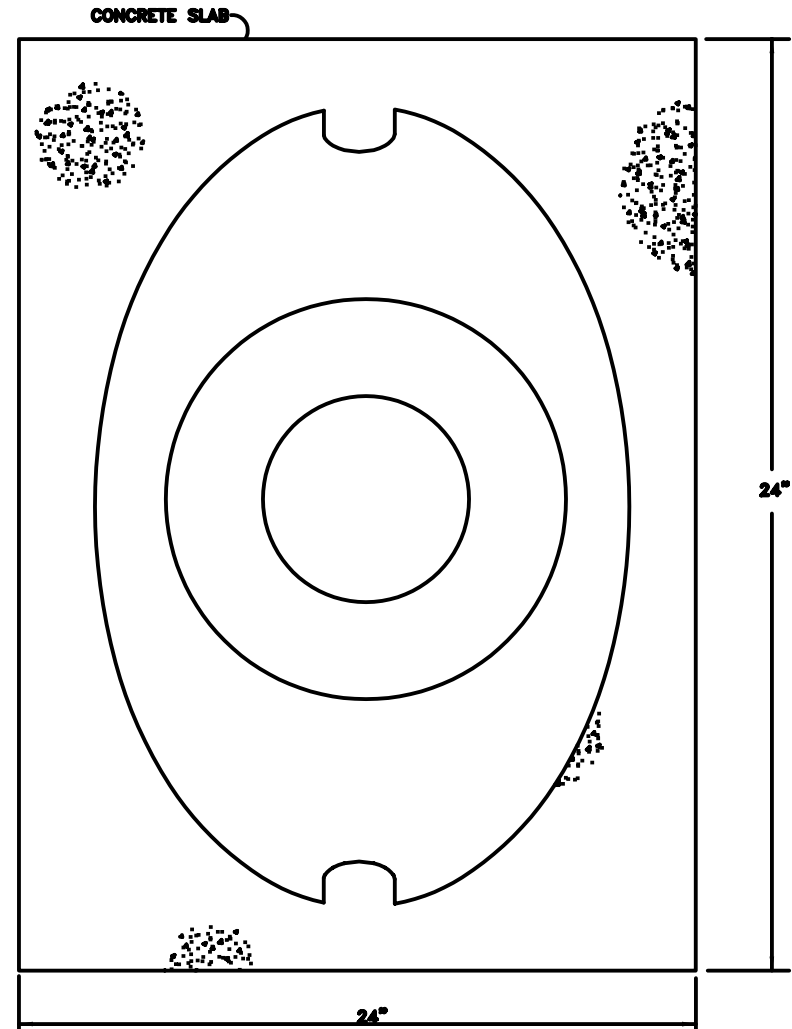
PLASTIC METER BOX
CONCRETE REINFORCEMENT
TRAFFIC CONDITIONS



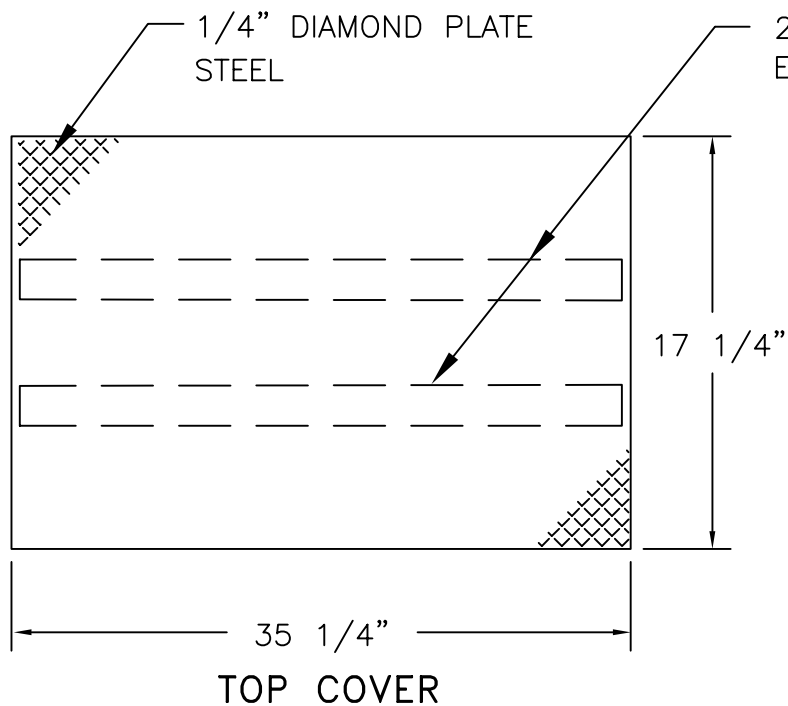
CITY OF NORFOLK, VA.
DEPT. OF UTILITIES



LARGE METER BOX
CONCRETE REINFORCEMENT
TRAFFIC CONDITIONS

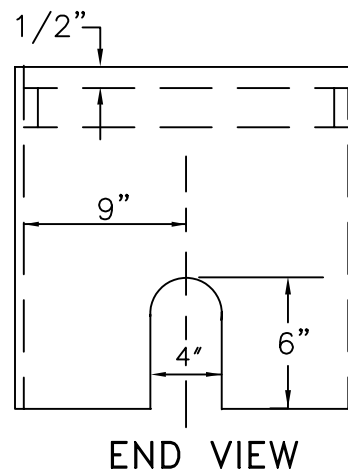
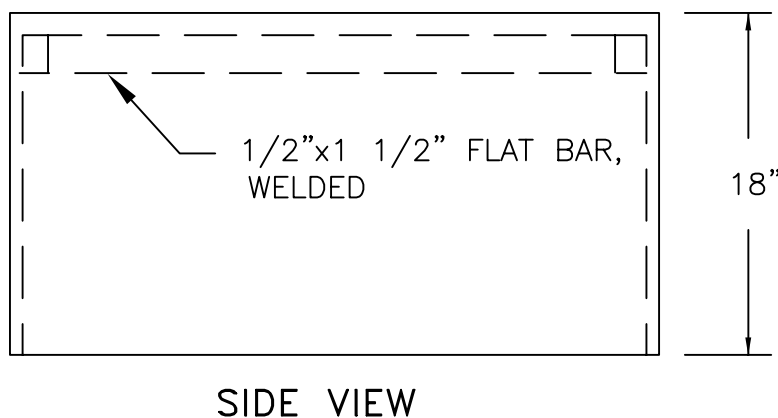
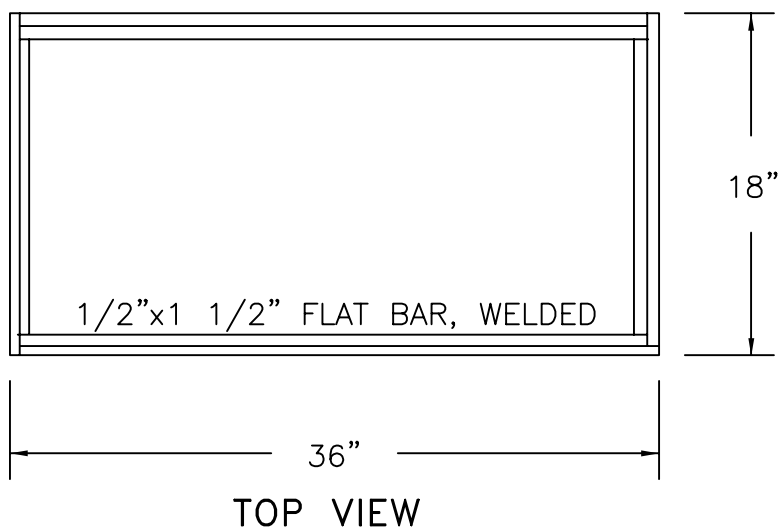


METER VAULT & TOP, SMALL

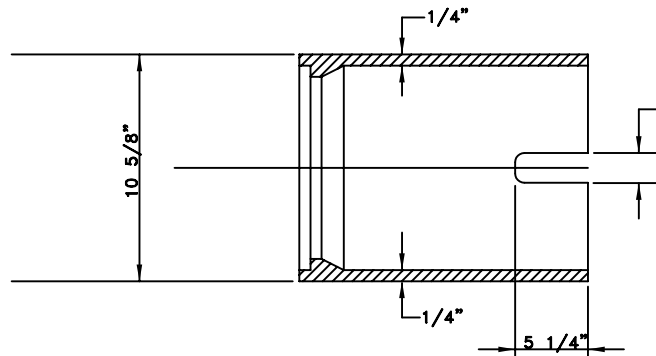
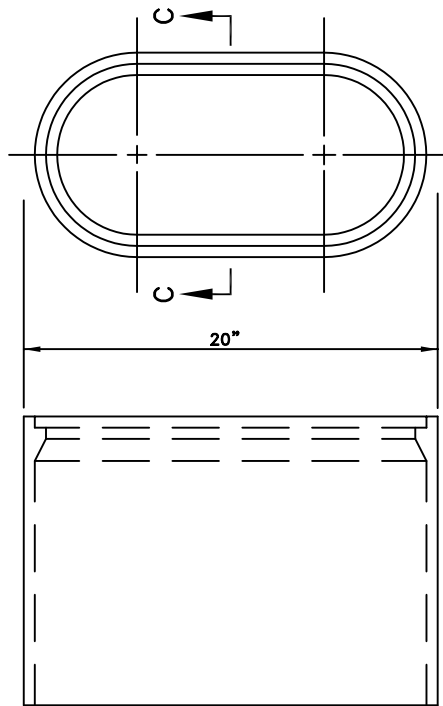


NOTE:

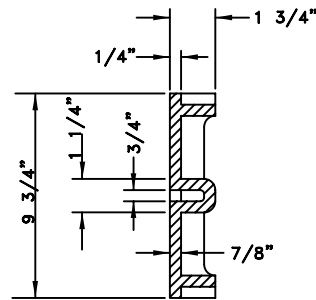
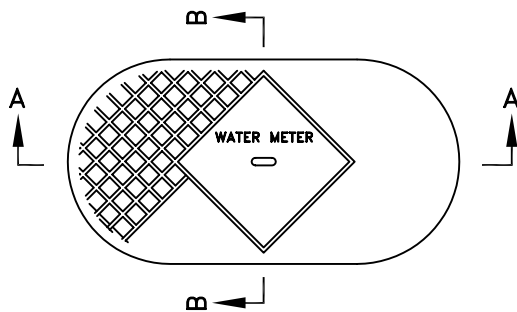
1. VAULT TO BE CONSTRUCTED OF 1/4" STD. SHEET STEEL.
2. ENTIRE VAULT & TOP TO BE COATED WITH 2 COATS RED LEAD PRIMER & 2 COATS RUST-OLEUM.



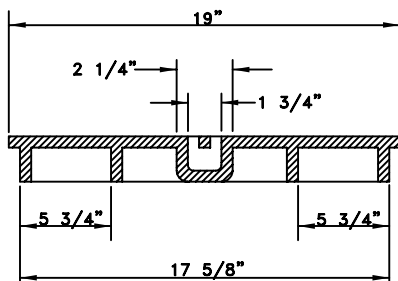
LARGE CAST IRON METER BOX & COVER



SECTION C-C



SECTION B-B

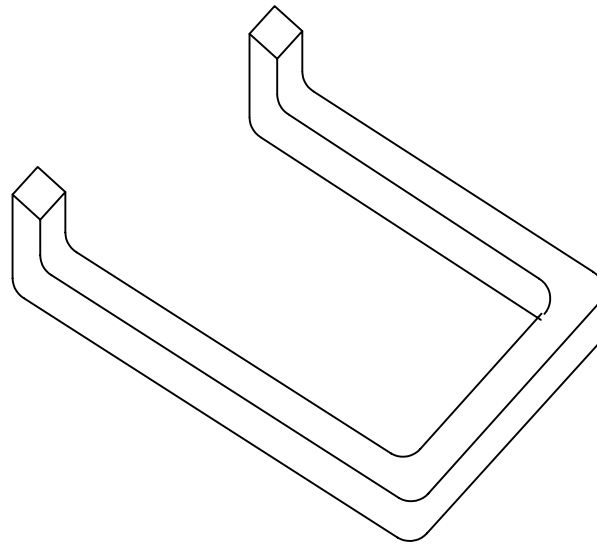


SECTION A-A

GENERAL SPECIFICATIONS

1. CAST IRON SHALL BE 35,000 P.S.I.
2. ASTM SPECS. A-48.60
3. WEIGHT SHALL BE PAINTED ON FRAME AND COVER
FRAME = 40 lbs.
COVER = 20 lbs.

NOT TO SCALE

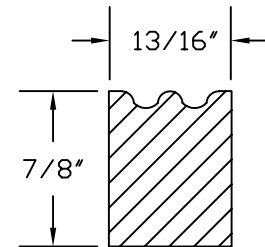


ISOMETRIC VIEW
SIDE VIEW
FRONT VIEW

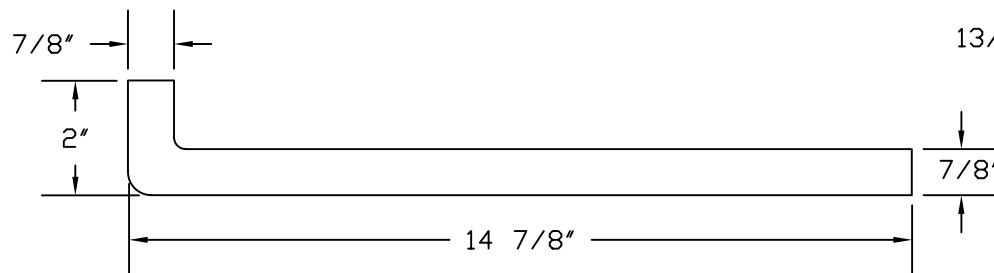
- PROPERTIES FOR DESIGN:
1. MINIMUM TENSILE STRENGTH 58,000 PSI.
 2. YIELD STRENGTH 35,000 PSI.
 3. ELONGATION-NOT LESS THAN 10% IN 2".
 4. LOAD CARRYING CAPACITY:

PROJECTION FROM WALL	MAXIMUM LOAD ON CENTER OF CROSS BAR WITHOUT PERMANENT DEFORMATION
6"-----	1000#
4"-----	1500#

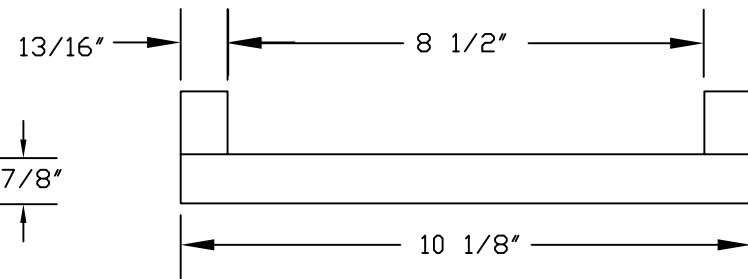
AA ALLOY 6061 - TEMPER CONDITION T 6



SECTION

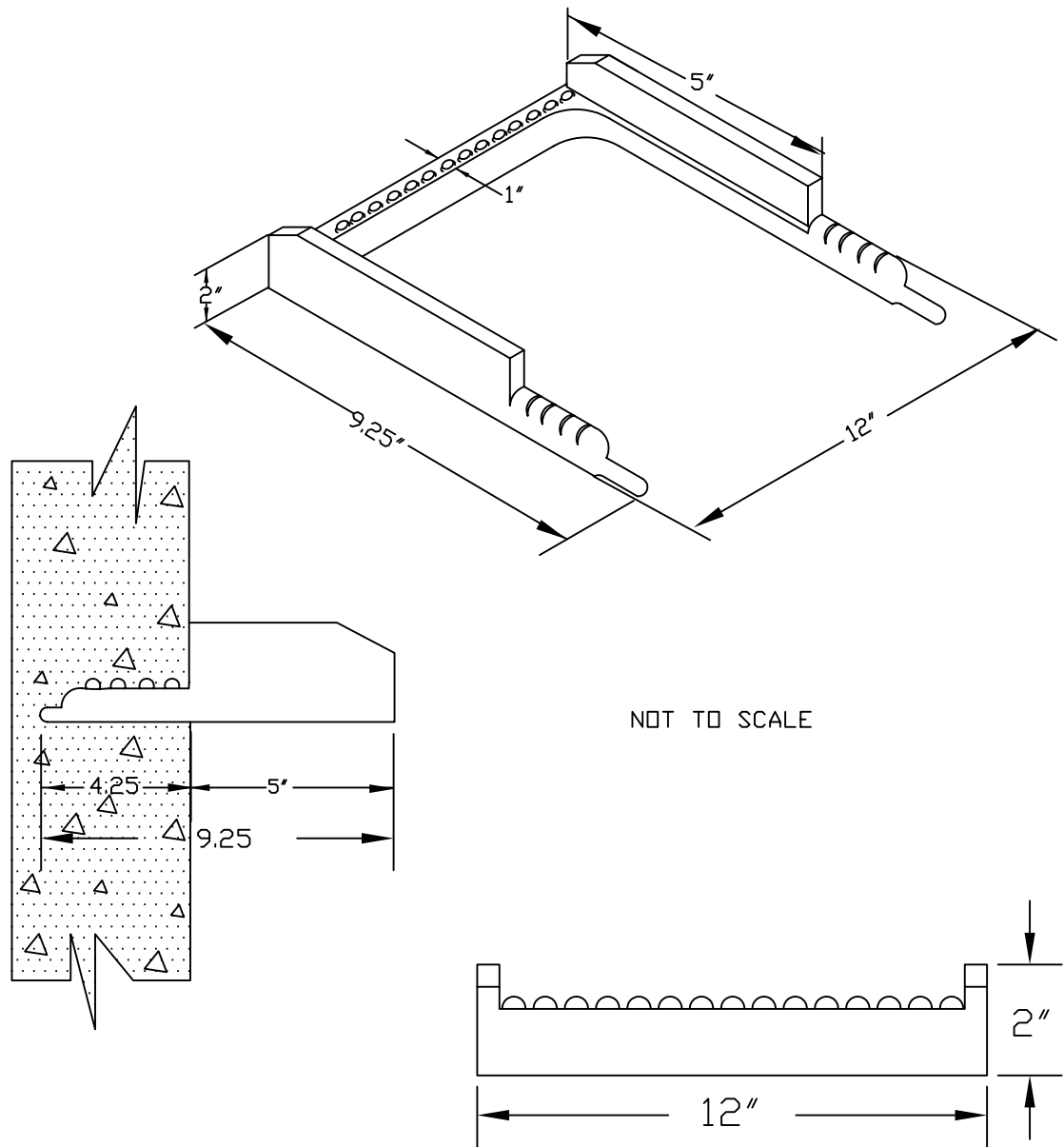


SIDE VIEW



FRONT VIEW

FORGED EXTRUDED
ALUMINUM ALLOY MANHOLE STEPS
DO NOT USE IN PRECAST MANHOLES

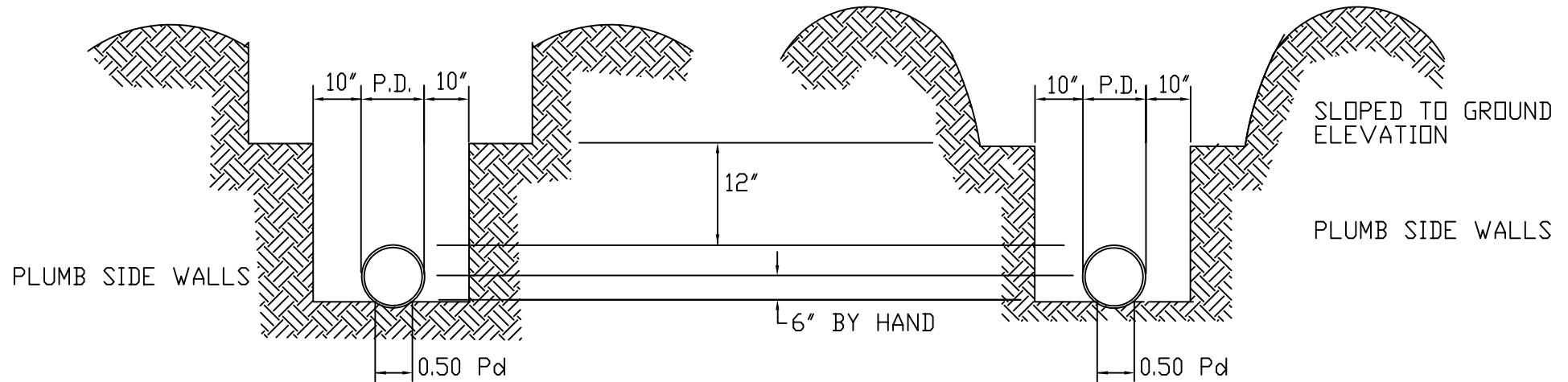


RUBBER STEP FOR PRECAST MANHOLE

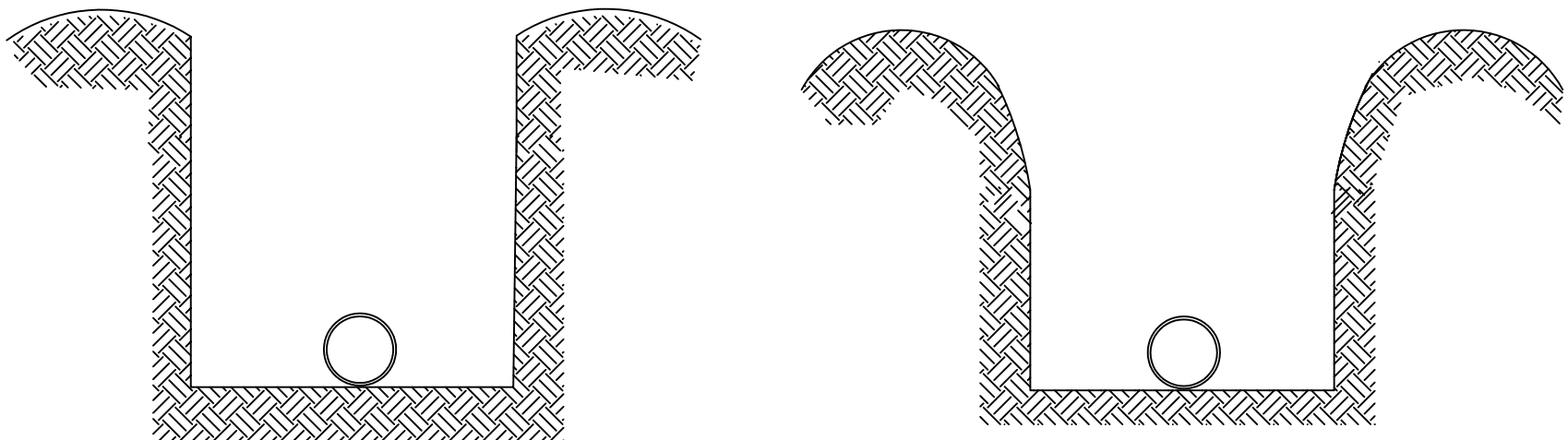
(AS MANUFACTURED BY OLIVER TIRE CO. OR APPROVED EQUAL)

STEP IS MADE OF NO. 4 REINFORCING ROD COMPLETELY ENCASED
IN A CORROSION-RESISTANT RUBBER.

ACCEPTABLE: EARTH LOADS NOT EXCESSIVE



NOT ACCEPTABLE: EXCESSIVE EARTH LOAD GENERATED



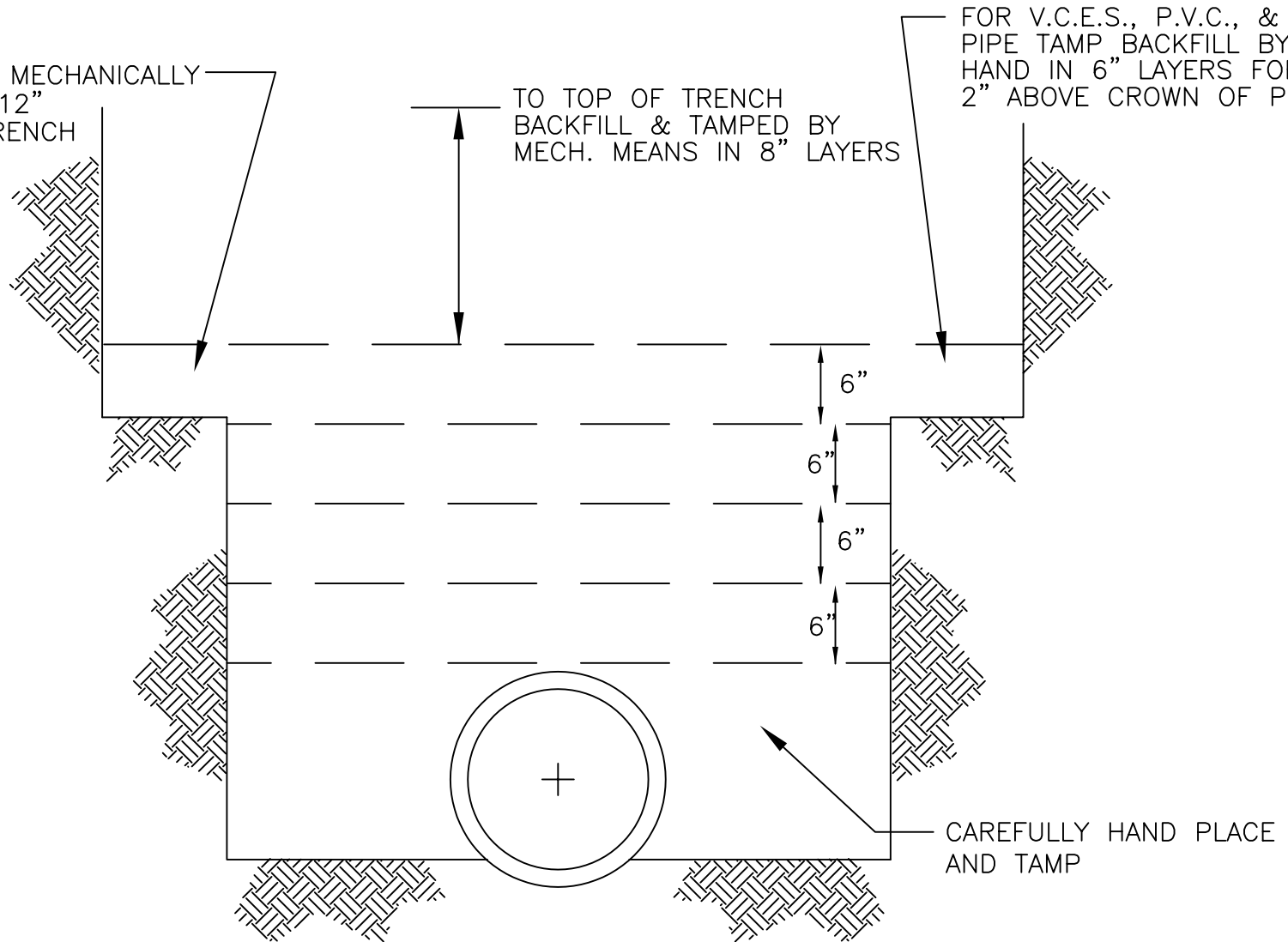
TRENCH EXCAVATION METHODS

BACKFILL METHODS

FOR C.I. OR D.I. PIPE MECHANICALLY
TAMP & BACKFILL IN 12"
LAYERS TO TOP OF TRENCH

TO TOP OF TRENCH
BACKFILL & TAMPED BY
MECH. MEANS IN 8" LAYERS

FOR V.C.E.S., P.V.C., & A.B.S.
PIPE TAMP BACKFILL BY
HAND IN 6" LAYERS FOR
2" ABOVE CROWN OF PIPE.



[illegible]

CITY OF NORFOLK, VA STANDARD NO. 35

TABLE II

REQUIRED COVER OVER PIPE AND VALVES FOR WATER MAINS THAT
ARE INSTALLED IN THE CITY OF NORFOLK, VA. ALL DIMENSIONS GIVEN
IN INCHES. (REF. SEE NO. 4-32 SPECIFICATIONS)

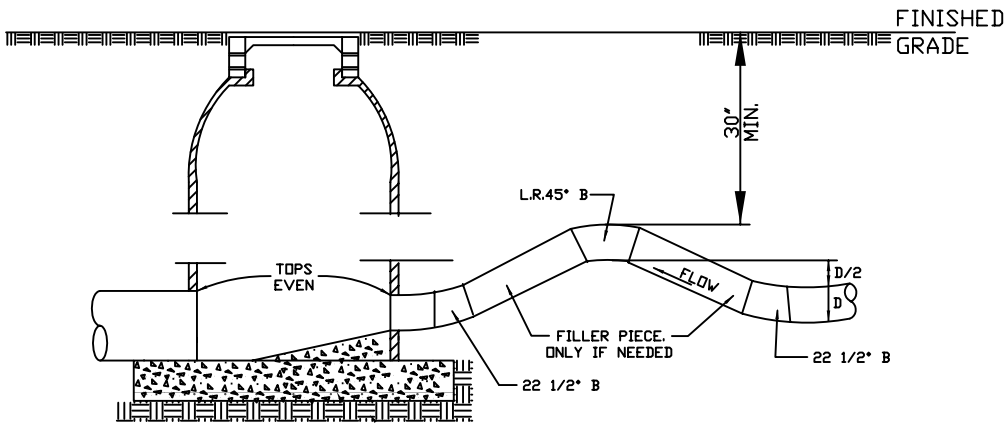
SIZE OF PIPE C.I.M.J.	DISTANCE FROM TOP OF PIPE TO TOP OF VALVE	REQUIRED COVER OVER PIPE	SIZE OF STD. M.J. GATE VALVES TAPER SEAT	REQUIRED COVER OVER VALVES
2"		30"	2	
3"	13.4	30"	3	16.6
4"	14.9	30"	4	15.1
6"	16.6	30"	6	13.4
8"	19.1	36"	8	16.9
10"	23.7	36"	10	12.3
12"	25.5	42"	12	16.5
14"	31.1	46"	14 +	14.9
16"	35.1	50"	16 +	14.9
			VERT. GEARED VALVES	
18	43.5	60	18	16.5
20	45.6	60	20	14.4
24	51.0	66 ++	24	15.0
30	59.2	72 ++	30	12.8
36	67.3	80 ++	36	12.7
42	79.1	92 ++	42	12.9
			HORZ. GEARED VALVES	
18	6.5	36	18	29.5
20	7.1	36	20	14.4
24	5.0	36	24	31.0
30	3.5	36	30	32.5
36	0.4	36	36	35.6
42	4.0	36	42	32.0

+ SIDEWEDGE, PARALLEL SEAT VALVE (VERTICAL)

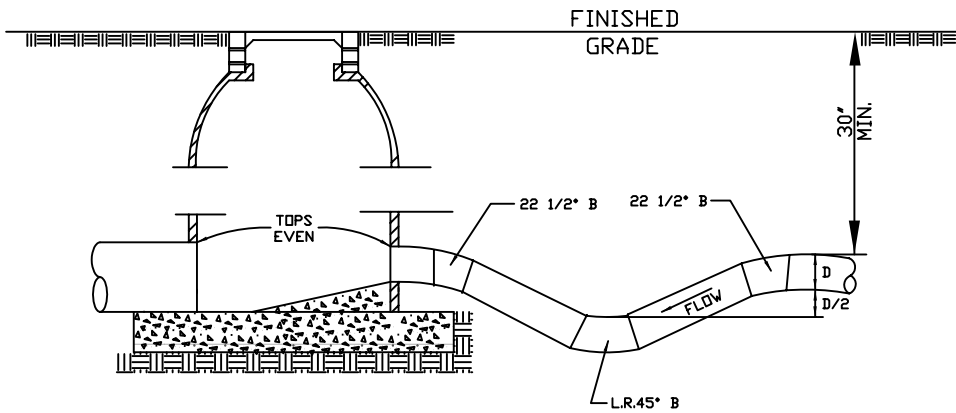
++ NOTE I: PIPE LAID WITH OVER 5' OF COVER SEE DWG. FOR SPECIAL LAYING CONDITIONS.

NOTE II: THE MINIMUM COVER OVER PIPES SHALL BE AS SHOWN IN TABLE NO. II FOR WATER MAINS INSTALLED IN THE CITY OF NORFOLK, EXCEPT WHEN SUCH CONDITIONS EXIST. TO PREVENT THIS COVER FROM BEING OBTAINED, IN WHICH EVENT THE AMOUNT OF COVER SHALL BE DETERMINED BY THE ENGINEER. THE AMOUNT OF COVER SHALL BE MEASURED FROM THE PROPOSED GRADE OF THE STREET OR THE EXISTING GRADE WHICH EVER MAY BE THE LOWER.

FOR DISCHARGE INTO DEEP MANHOLE

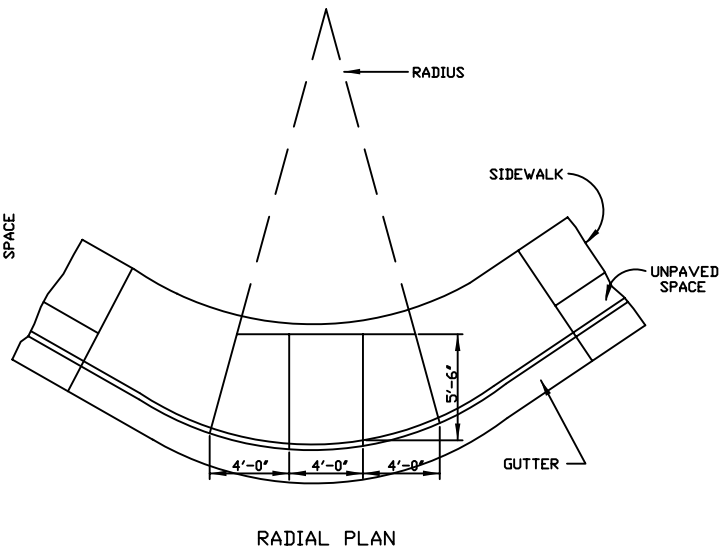
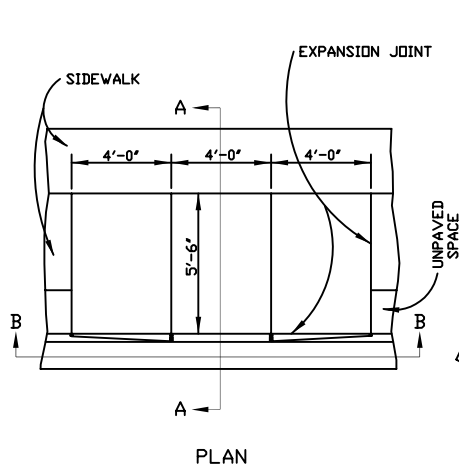


FOR DISCHARGE INTO SHALLOW MANHOLE



NO SCALE

C.S.37



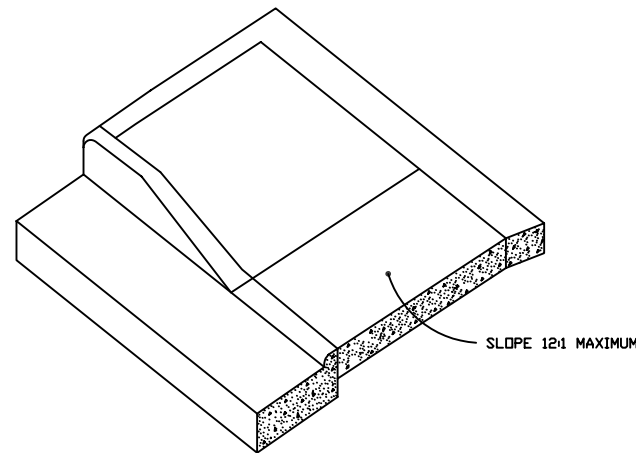
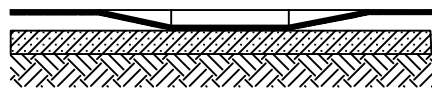
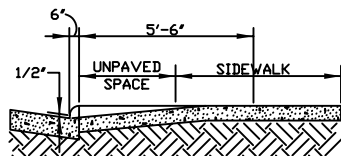
NOTES: All concrete to be class A-3

Ramp surface shall be constructed with a non-skid finish.

Ramp shall not exceed a maximum slope of 12:1.

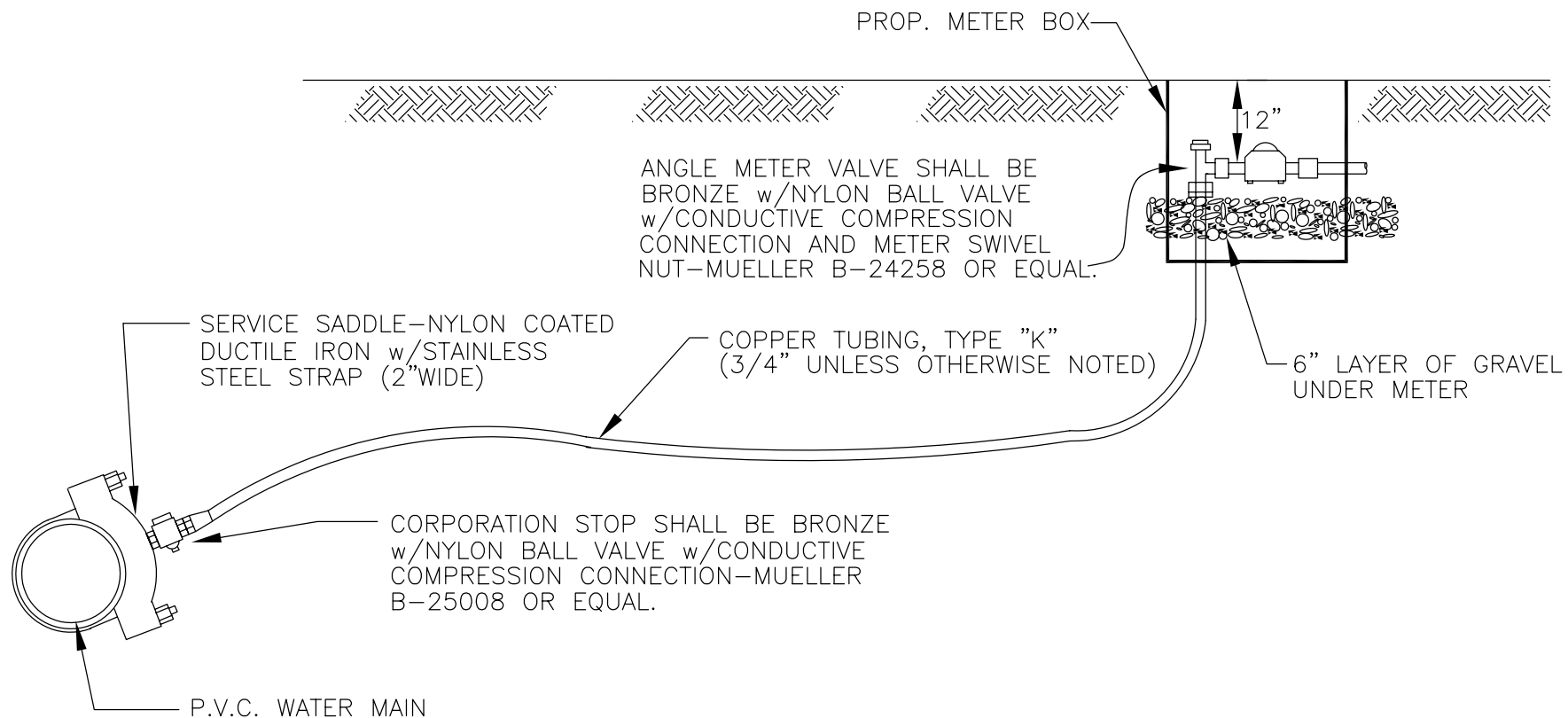
Curb cut ramps are to be located as shown on the plans or as directed by the Engineer. They should be offset from pedestrian crosswalks but should not be located behind vehicle stop lines. Existing light poles fire hydrants, drop inlet, etc. will also affect placement.

Cut ramps will be measured and paid for at the contract unit prices for sidewalk, curb and gutter, or other components thereof which price shall include all work necessary to shape or modify the items as required.



CURB CUT RAMP

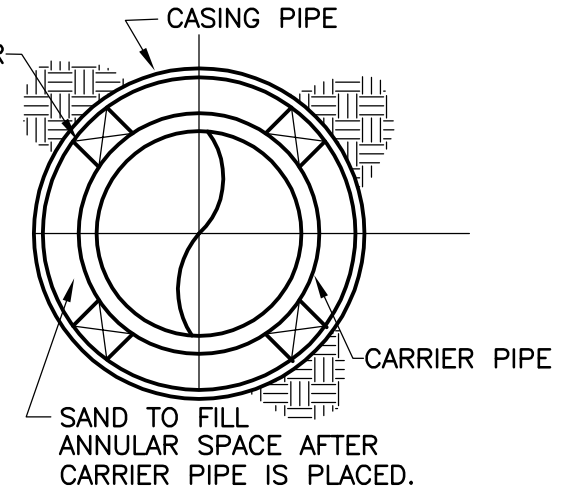
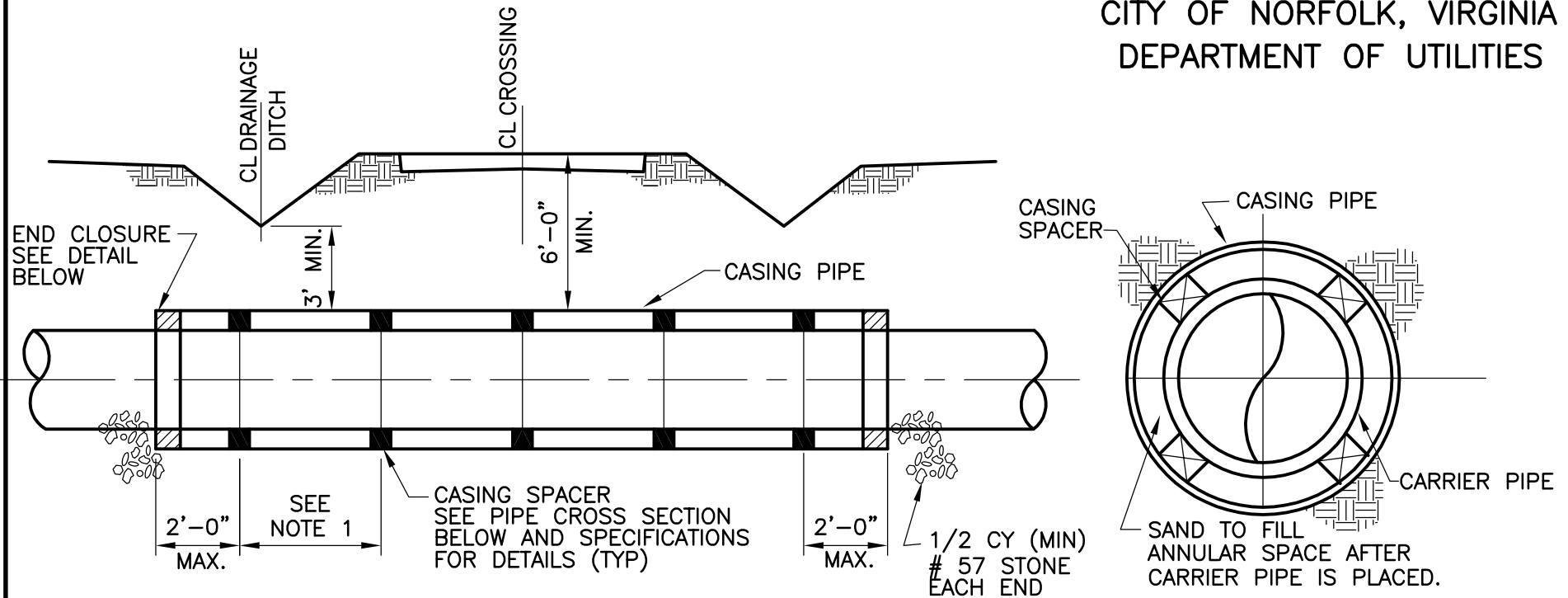
< FACILITY FOR PHYSICALLY HANDICAPPED >



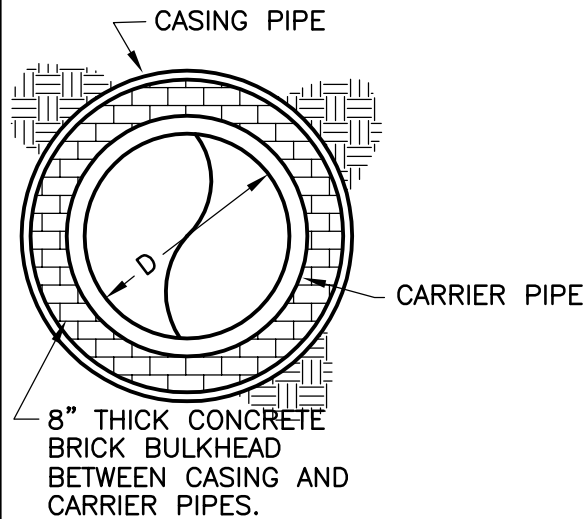
TYPICAL TAP INSTALLATION DETAIL

SCALE: N.T.S.

CITY OF NORFOLK, VIRGINIA
DEPARTMENT OF UTILITIES



PIPE CROSS SECTION



END CLOSURE

NOTES:

1. PROVIDE FOUR POINT CASING PIPE SUPPORT FOR EACH PIPELINE SECTION. CENTER SPACERS SHALL BE CENTERED BETWEEN OUTSIDE SPACERS, OUTSIDE SPACERS SHALL BE 1'-0" FROM JOINT.
2. CARRIER PIPE SHALL BE RESTRAINED JOINT DUCTILE IRON PIPE.
3. FOR CASING SIZES AND ALLOWABLE MATERIALS, SEE FIGURE B
4. PROVIDE STAINLESS STEEL SPACERS WITH UHMW RUNNERS. ELECTRICALLY ISOLATE CARRIER PIPE FROM CASING PIPE.

WATER LINE CASING DETAIL

NO SCALE

C.S. 40A

CITY OF NORFOLK, VIRGINIA
DEPARTMENT OF UTILITIES

CASING PIPE REQUIREMENTS						
CARRIER PIPE DIA.	MINIMUM CASING PIPE DIA.	MINIMUM WALL THICKNESS				
		CRITERIA WITHIN RAILROAD RIGHT OF WAY		CRITERIA WITHIN CITY OR VDOT RIGHT OF WAY		MINIMUM NUMBER OF CASING SPACER RUNNERS
		R.C.P. PROTECTIVE COATING	STEEL WITH PROTECTIVE COATING	R.C.P.	STEEL	
4"	12"	3.0	0.375	3.0	0.250	4
6"	18"	3.0	0.375	3.0	0.250	4
8"	18"	3.0	0.375	3.0	0.250	4
10"	20"	3.0	0.375	3.0	0.250	4
12"	24"	3.5	0.375	3.5	0.250	4
16"	30"	4.0	0.500	4.0	0.375	6
18"	30"	4.0	0.500	4.0	0.375	6
20"	36"	4.5	0.563	4.5	0.375	6
24"	42"	5.0	0.625	5.0	0.500	6

NOTES:

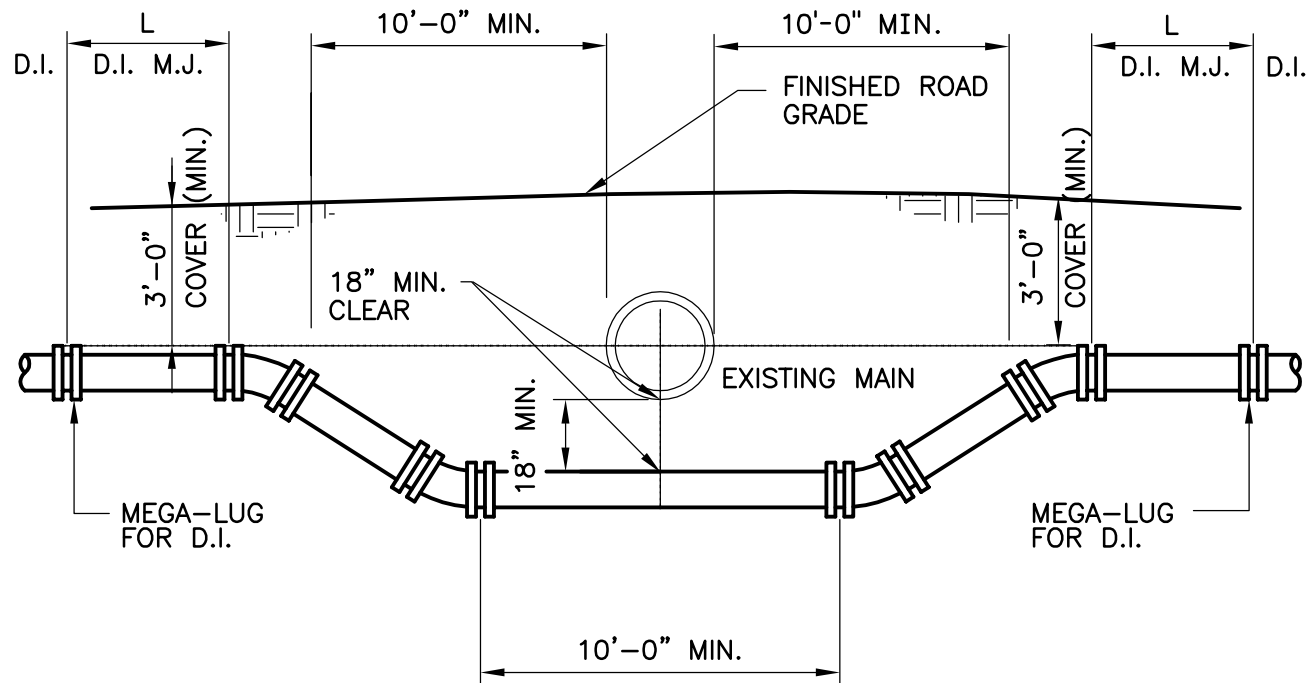
1. SLOPE CASING PIPE AT MINIMUM GRADE OF 1/16" PER FOOT
2. PROVIDE 2" WEEP HOLE EACH END.
3. INCREASING THICKNESS OF CASING MUST BE CONSIDERED WHERE BORE LENGTHS EXCEED 125 FEET.

WATER LINE CASING REQUIRMENTS

NO SCALE

C.S.40B

CITY OF NORFOLK, VIRGINIA
DEPARTMENT OF UTILITIES



NOTES:

1. LOWERED SECTION TO BE OF DUCTILE IRON MECHANICAL JOINT PIPE WITH RESTRAINED JOINTS.
2. THE DESIGN ENGINEER SHALL CALCULATE LENGTH (L) OF RESTRAINED SECTION.

LOWERING WATER MAIN
OR NEW CONSTRUCTION

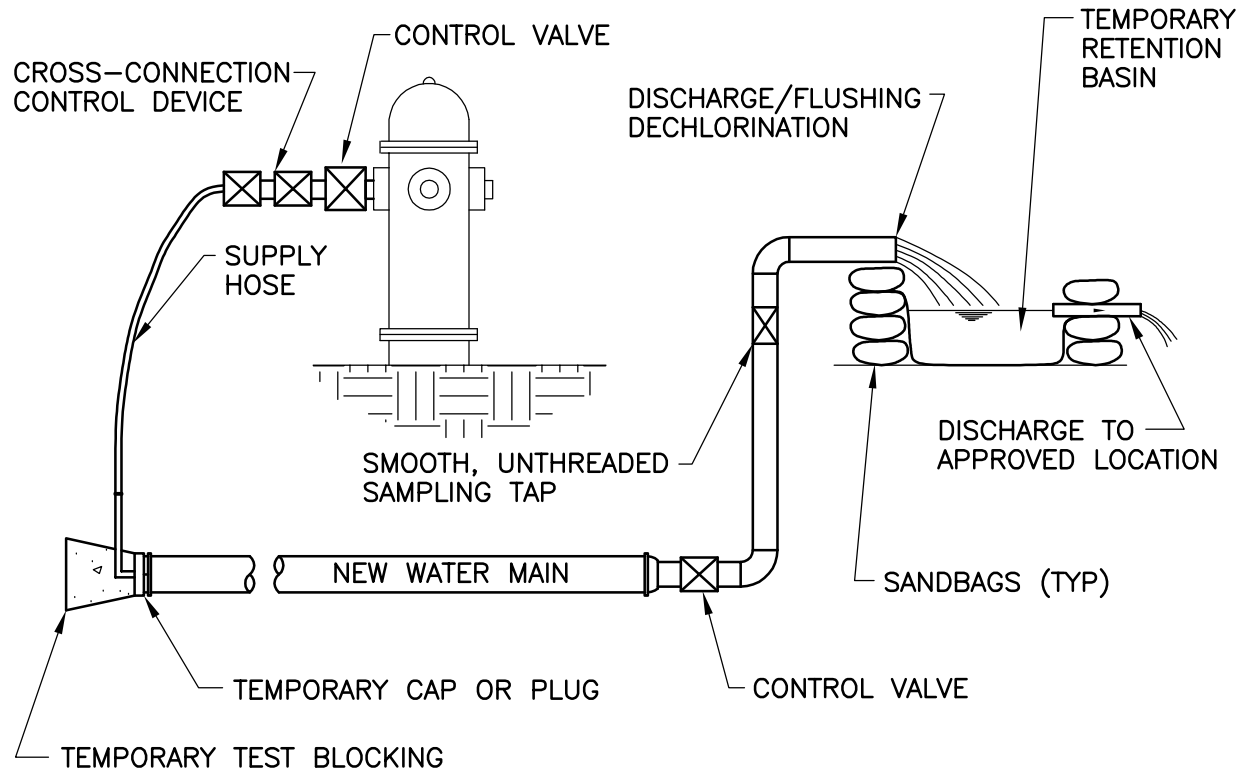
NO SCALE

C.S. 41

CITY OF NORFOLK, VIRGINIA DEPARTMENT OF UTILITIES

NOTES:

1. CROSS CONNECTION CONTROL DEVICE IN ACCORDANCE WITH CITY CROSS CONNECTION POLICY
2. CONTRACTOR MUST USE CLEAN POTABLE WATER SUPPLY HOSE ONLY.
3. CONTRACTOR MUST RECEIVE DEPARTMENT APPROVAL PRIOR TO DISCHARGE TO STORM OR SANITARY SEWER.
4. THIS SUGGESTED DISINFECTION AND DECHLORINATION STATION CAN BE USED FOR PIPE SIZES 4 INCH THROUGH 12 INCH. LARGER SIZES MUST BE HANDLED ON A CASE BY CASE BASIS.
5. CHLORINE RESIDUAL OF WATER BEING DISPOSED MAY BE NEUTRALIZED BY TREATING WITH ONE OF THE CHEMICALS LISTED BELOW.



SUGGESTED AMOUNTS OF CHEMICALS REQUIRED TO NEUTRALIZE VARIOUS RESIDUAL CHLORINE CONCENTRATIONS IN 100,000 GALLONS (378.5 m³) WATER.

CHEMICAL REQUIRED								
RESIDUAL CHLORINE CONCENTRATION	SULFUR DIOXIDE (SO 2)		SODIUM BISULFITE (NaHSO 3)		SODIUM SULFITE (Na2 SO 3)		SODIUM THIOSULFATE (Na2 S2 O -5H2 O)	
mg/L	lb.	(kg)	lb.	(kg)	lb.	(kg)	lb.	(kg)
1	0.8	(.36)	1.2	(.54)	1.4	(.64)	1.2	(.54)
2	1.7	(.77)	2.5	(1.13)	2.9	(1.32)	2.4	(1.09)
10	8.3	(3.76)	12.5	(5.67)	14.6	(6.62)	12.0	(5.44)
50	41.7	(18.91)	62.6	(28.39)	73.0	(33.11)	60.0	(27.22)

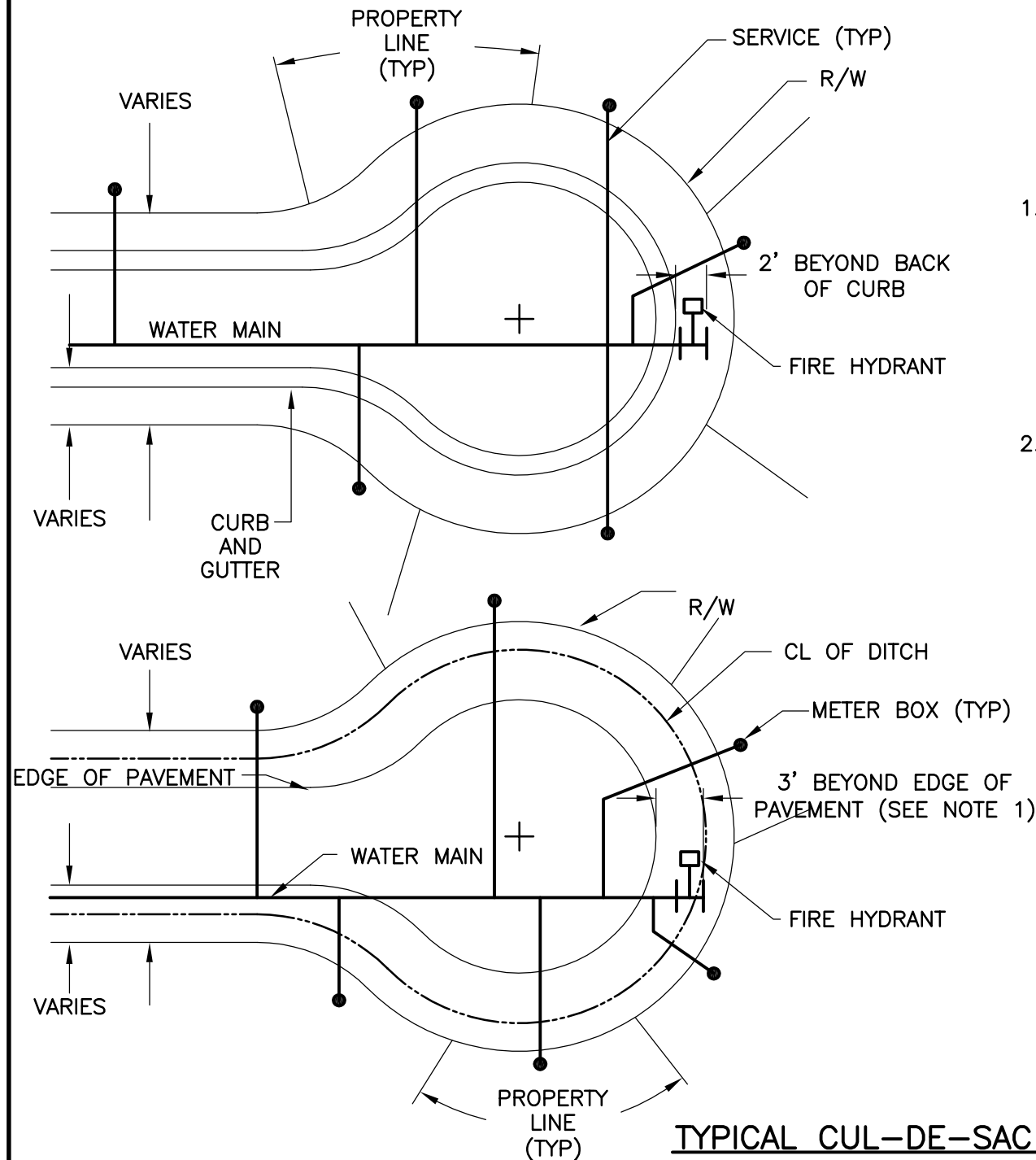
SUGGESTED WATER MAIN DISINFECTION AND DECHLORINATION ARRANGEMENT

NO SCALE

CITY OF NORFOLK, VIRGINIA
DEPARTMENT OF UTILITIES

NOTE:

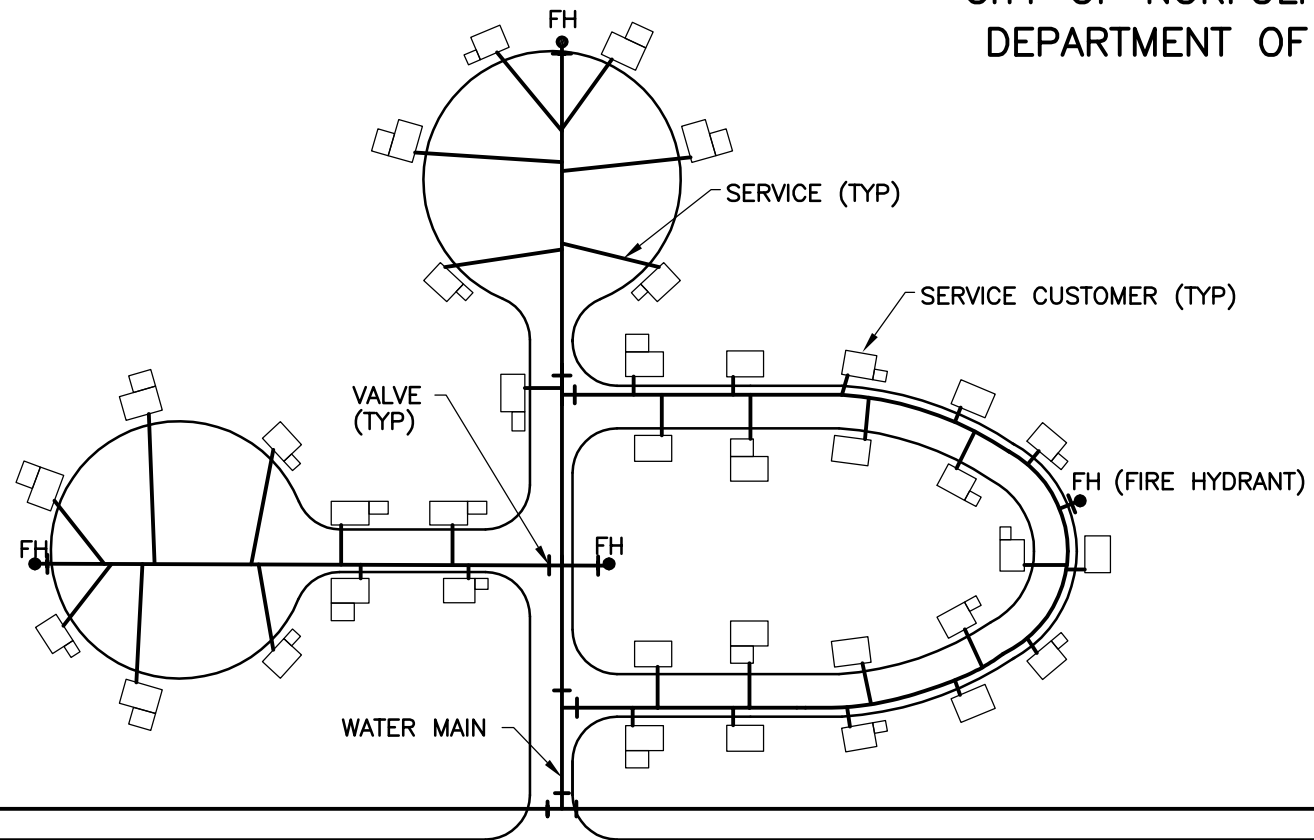
1. WHERE A DITCH EXISTS OR PROPOSED FIRE HYDRANT IS TO BE PLACED BETWEEN THE DITCH AND EDGE OF PAVEMENT ON LEVEL GROUND. IF THIS IS NOT POSSIBLE, THE UTILITY CONSTRUCTION INSPECTOR MUST BE CONSULTED, FIRE HYDRANT SHOULD BE 1' IN FRONT OF PROPERTY PIN OR BEYOND DITCH, MIN. 3.5' COVER UNDER DITCH.
2. RESIDENTIAL METER BOXES SHALL BE PLACED IN THE MIDDLE OF EACH LOT. METER BOXES SHALL NOT BE PLACED IN DRIVEWAYS OR SIDEWALKS.



TYPICAL CUL-DE-SAC LAYOUT WATER

NO SCALE

CITY OF NORFOLK, VIRGINIA
DEPARTMENT OF UTILITIES



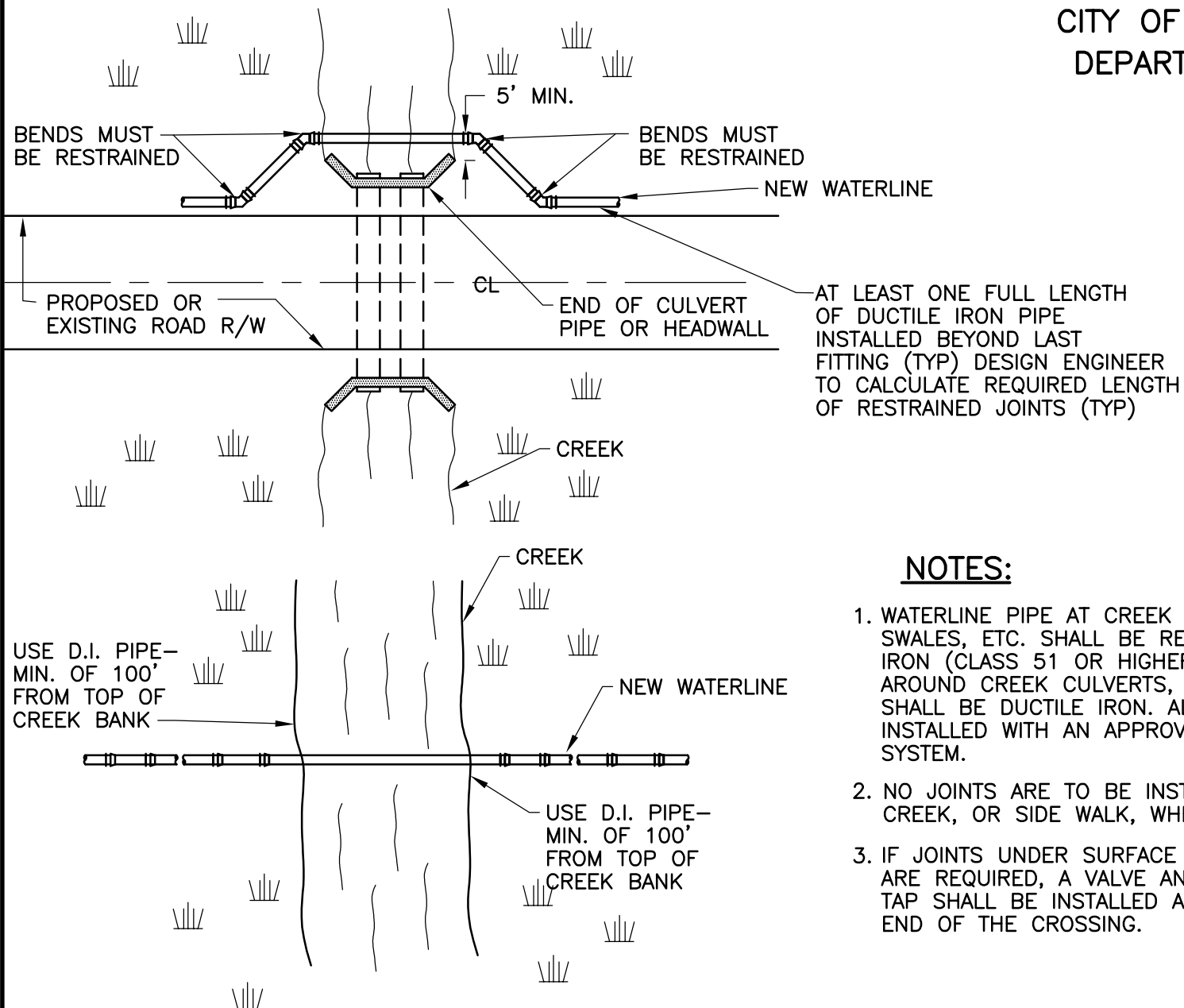
NOTES:

1. FIRE HYDRANTS SHOULD BE LOCATED IN ACCORDANCE WITH DEPARTMENT DESIGN STANDARDS AND REQUIREMENTS OF THE NORFOLK FIRE DEPARTMENT
2. WATER MAINS SHALL BE 6" PIPE OR LARGE
3. DESIGN ENGINEER SHALL SIZE METER AND SERVICE CONNECTION IN ACCORDANCE WITH THE LATEST EDITION OF THE INTERNATIONAL PLUMBING CODE
4. METER BOX AND SERVICE SHALL BE LOCATED IN THE CENTER OF EACH LOT ADJACENT TO THE RIGHT OF WAY

TYPICAL SUBDIVISION LAYOUT
WATER

NO SCALE

CITY OF NORFOLK, VIRGINIA
DEPARTMENT OF UTILITIES

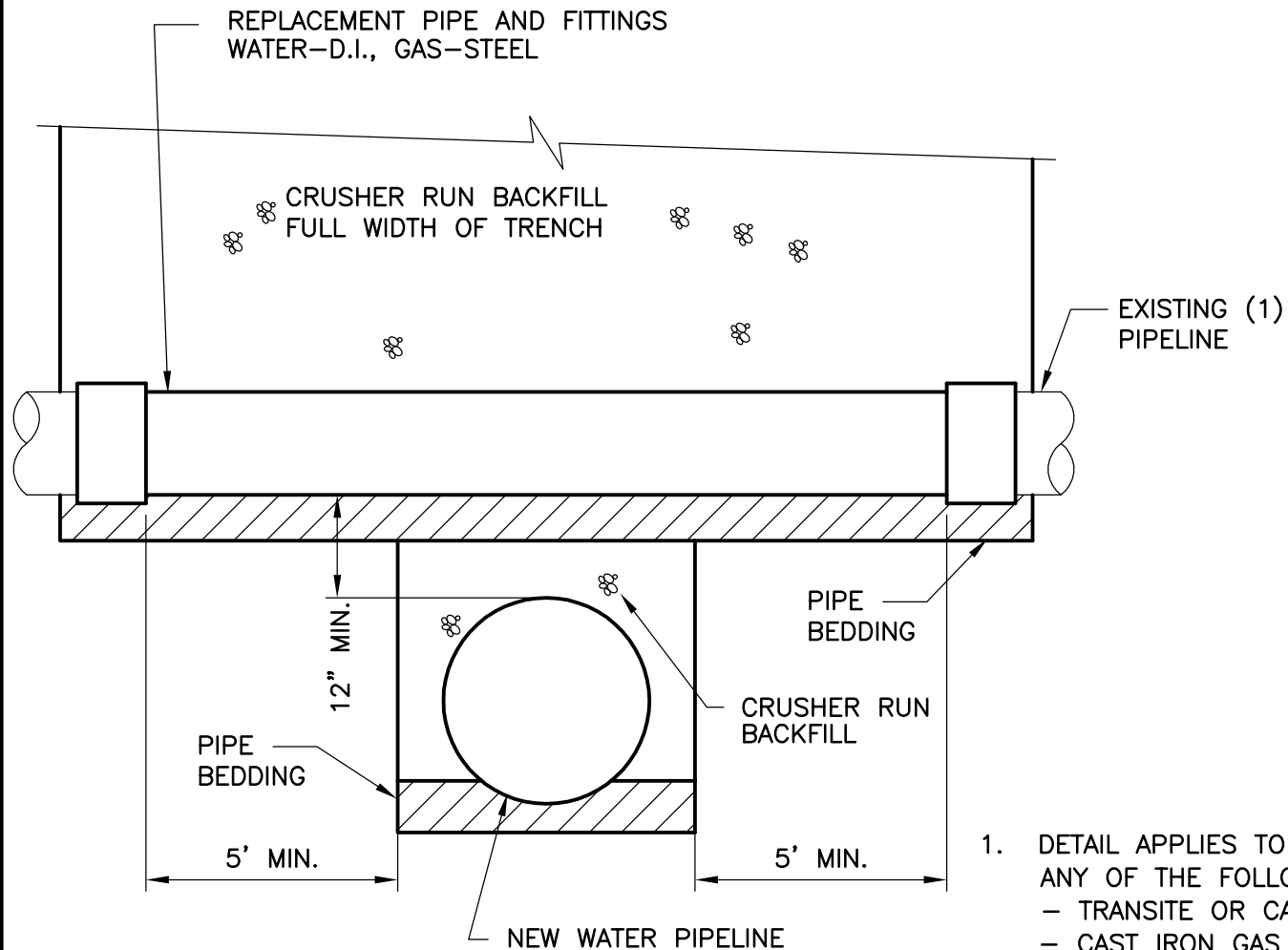


NOTES:

1. WATERLINE PIPE AT CREEK CROSSINGS, RIVERS, SWALES, ETC. SHALL BE RESTRAINED JOINT DUCTILE IRON (CLASS 51 OR HIGHER). IF WATERLINE IS OFFSET AROUND CREEK CULVERTS, ENTIRE RUN OF OFFSET SHALL BE DUCTILE IRON. ALL FITTINGS SHALL BE INSTALLED WITH AN APPROVED JOINT RESTRAINT SYSTEM.
2. NO JOINTS ARE TO BE INSTALLED UNDER THE CREEK, OR SIDE WALK, WHERE POSSIBLE.
3. IF JOINTS UNDER SURFACE WATER ARE REQUIRED, A VALVE AND SAMPLE TAP SHALL BE INSTALLED AT EACH END OF THE CROSSING.

TYPICAL WATERLINE CREEK CROSSING

NO SCALE

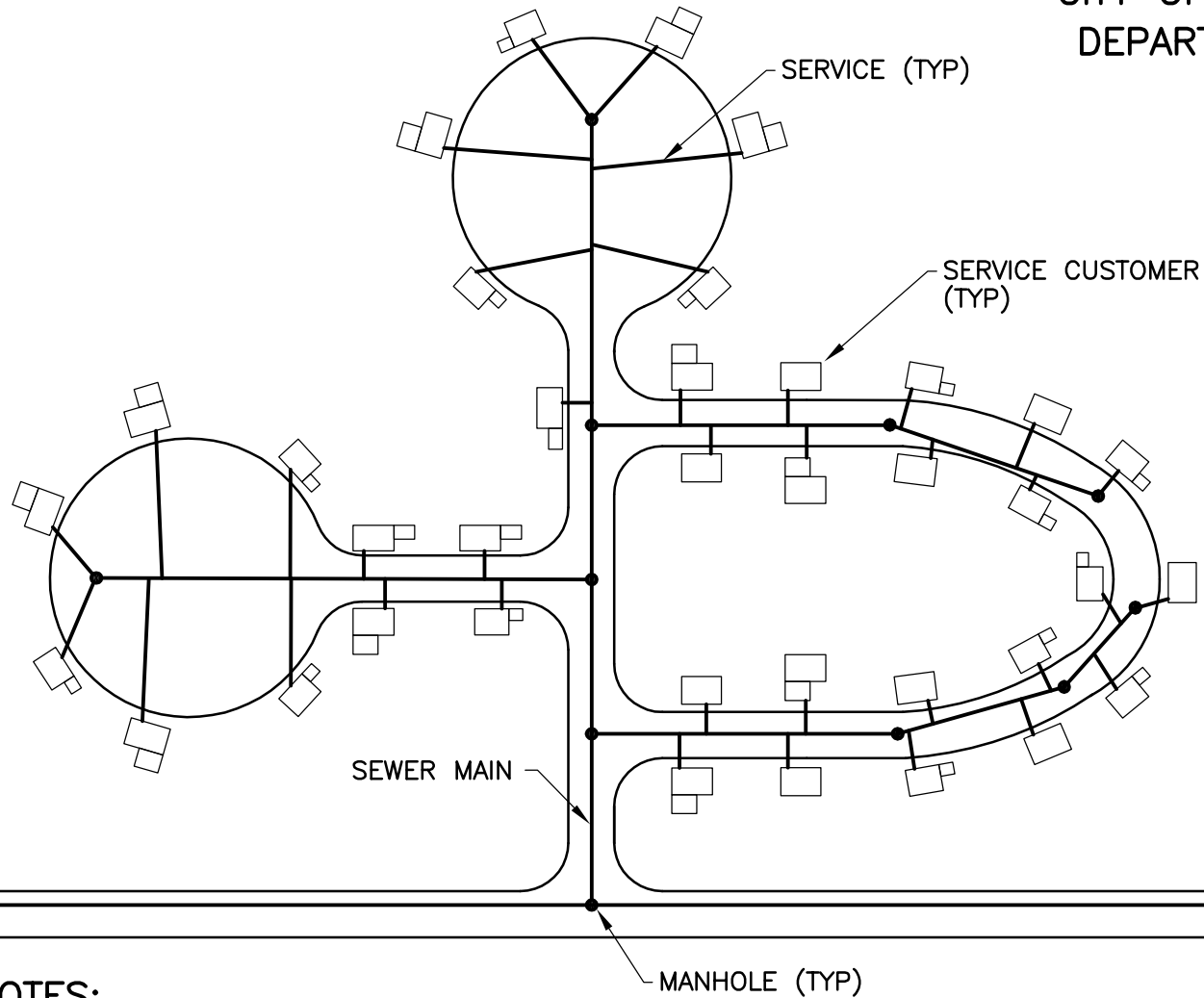


1. DETAIL APPLIES TO NEW WATERLINE CROSSING ANY OF THE FOLLOWING:
 – TRANSITE OR CAST IRON WATER LINE
 – CAST IRON GAS LINE
 DETAIL DOES NOT APPLY TO WATER/SEWER CROSSINGS.
2. FOR APPROPRIATE PIPE BEDDING, REFER TO HRPDC STANDARD DETAILS.

WATER MAIN CROSSING
UNDER EXISTING PIPELINES

NO SCALE

CITY OF NORFOLK, VIRGINIA
DEPARTMENT OF UTILITIES



NOTES:

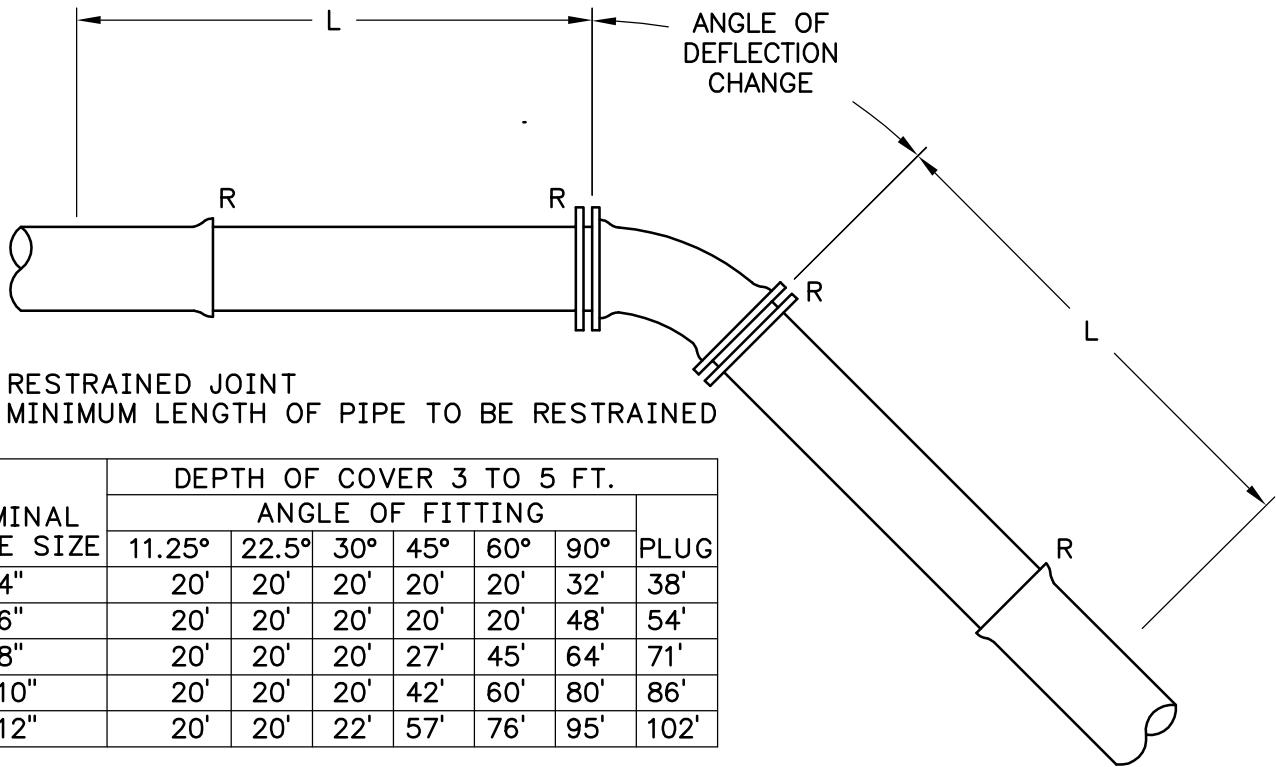
1. SEWER MAINS SHALL BE 8" OR LARGER
2. SERVICE CONNECTIONS SHALL BE AT AN ANGLE OF 90° TO THE MAIN, WITH THE ACTUAL CONNECTION USING A 45° ANGLE FITTING IN THE DIRECTION OF FLOW
3. SERVICES SHALL HAVE A MINIMUM SLOPE OF 1/4" PER 1 FOOT

TYPICAL SUBDIVISION LAYOUT
SEWER

NO SCALE

C.S. 47

CITY OF NORFOLK, VIRGINIA
DEPARTMENT OF UTILITIES



NOMINAL PIPE SIZE	DEPTH OF COVER 3 TO 5 FT.						
	ANGLE OF FITTING						PLUG
	11.25°	22.5°	30°	45°	60°	90°	
4"	20'	20'	20'	20'	20'	32'	38'
6"	20'	20'	20'	20'	20'	48'	54'
8"	20'	20'	20'	27'	45'	64'	71'
10"	20'	20'	20'	42'	60'	80'	86'
12"	20'	20'	22'	57'	76'	95'	102'

NOMINAL PIPE SIZE	DEPTH OF COVER 5 FT. OR GREATER						
	ANGLE OF FITTING						PLUG
	11.25°	22.5°	30°	45°	60°	90°	
4"	20'	20'	20'	20'	20'	20'	23'
6"	20'	20'	20'	20'	20'	27'	33'
8"	20'	20'	20'	20'	20'	37'	43'
10"	20'	20'	20'	20'	27'	47'	53'
12"	20'	20'	20'	21'	37'	56'	63'

ASSUMPTIONS USED FOR THE
DEVELOPMENT OF THIS CHART

1. COMPLETELY SATURATED SOIL
2. MAXIMUM SUSTAINED PRESSURE= 75 PSI
3. MAXIMUM TRANSIENT PRESSURE=125 PSI

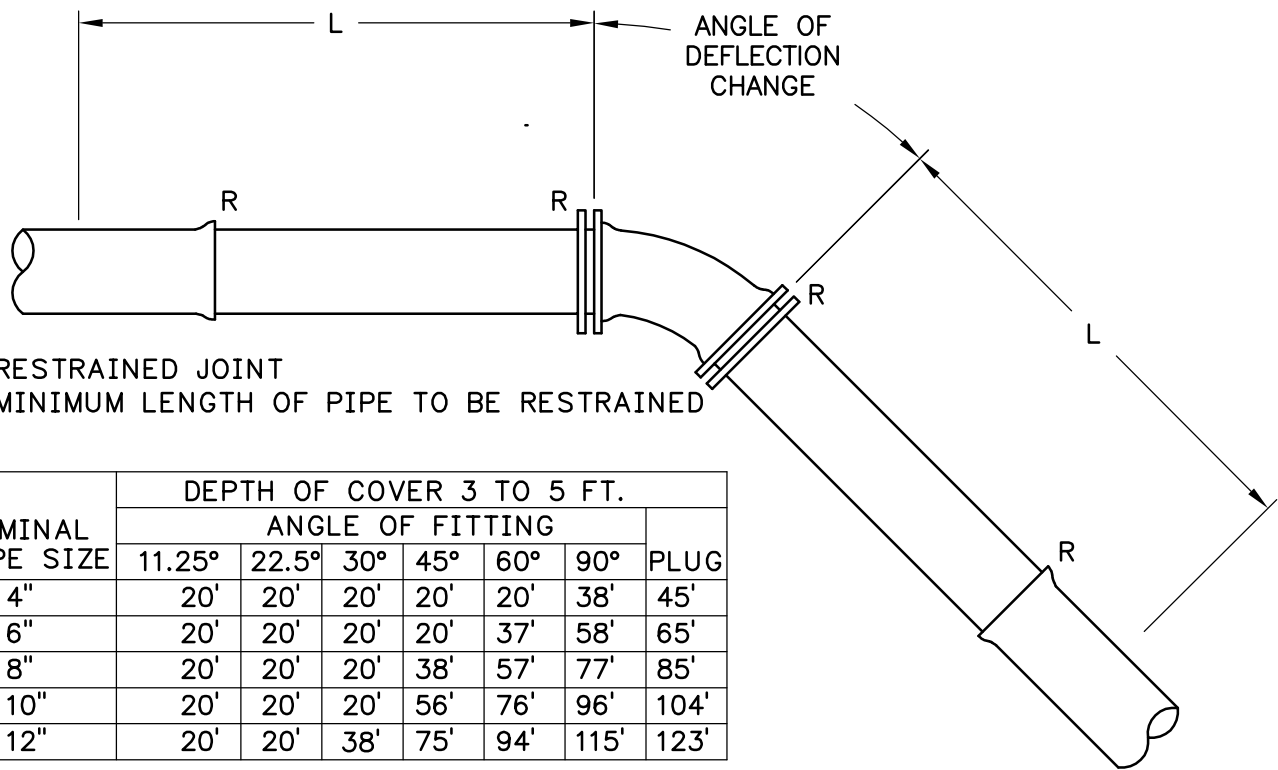
NOTE: THIS CHART WAS DEVELOPED USING CONSERVATIVE ASSUMPTIONS AND IS INTENDED TO BE USED FOR REPAIRS AND RELOCATIONS WHEN THE ACTUAL SOIL CONDITIONS HAVE NOT BEEN EVALUATED. DESIGN ENGINEERS FOR NEW PROJECTS SHALL CALCULATE JOINT RESTRAINT REQUIREMENTS BASED ON ACTUAL CONDITIONS.

THRUST RESTRAINT FOR
DUCTILE IRON PIPE

NO SCALE

C.S. 48

CITY OF NORFOLK, VIRGINIA
DEPARTMENT OF UTILITIES



NOMINAL PIPE SIZE	DEPTH OF COVER 3 TO 5 FT.						
	ANGLE OF FITTING						PLUG
	11.25°	22.5°	30°	45°	60°	90°	
4"	20'	20'	20'	20'	20'	38'	45'
6"	20'	20'	20'	20'	37'	58'	65'
8"	20'	20'	20'	38'	57'	77'	85'
10"	20'	20'	20'	56'	76'	96'	104'
12"	20'	20'	38'	75'	94'	115'	123'

NOMINAL PIPE SIZE	DEPTH OF COVER 5 FT. OR GREATER						
	ANGLE OF FITTING						PLUG
	11.25°	22.5°	30°	45°	60°	90°	
4"	20'	20'	20'	20'	20'	20'	37'
6"	20'	20'	20'	20'	20'	32'	39'
8"	20'	20'	20'	20'	24'	44'	51'
10"	20'	20'	20'	20'	35'	55'	63'
12"	20'	20'	20'	27'	46'	67'	74'

ASSUMPTIONS USED FOR THE
DEVELOPMENT OF THIS CHART

1. COMPLETELY SATURATED SOIL
2. MAXIMUM SUSTAINED PRESSURE=75 PSI
3. MAXIMUM TRANSIENT PRESSURE=125 PSI

NOTE:

THIS CHART WAS DEVELOPED USING CONSERVATIVE ASSUMPTIONS AND IS INTENDED TO BE USED FOR REPAIRS AND RELOCATIONS WHEN THE ACTUAL SOIL CONDITIONS HAVE NOT BEEN EVALUATED. DESIGN ENGINEERS FOR NEW PROJECTS SHALL CALCULATE JOINT RESTRAINT REQUIREMENTS BASED ON ACTUAL CONDITIONS.

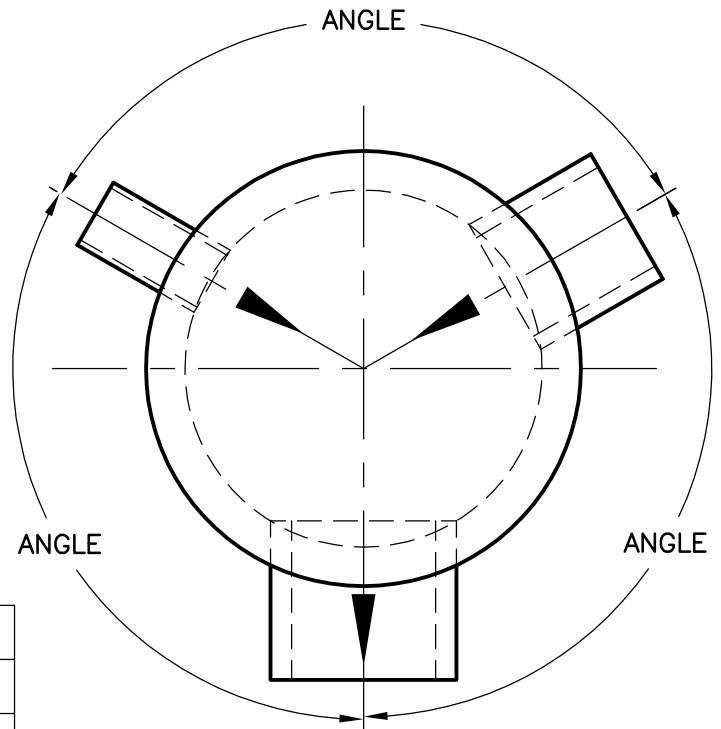
THRUST RESTRAINT FOR
PVC, C900 PIPE

NO SCALE

C.S. 49

CITY OF NORFOLK, VIRGINIA
DEPARTMENT OF UTILITIES

ALLOWABLE ANGLES FOR
PRECAST MANHOLES



PIPE SIZE	48" DIAMETER MANHOLE					
	12"	15"	18"	21"	24"	27"
12"	59°	55°	70°	76°	80°	87°
15"		70°	75°	80°	85°	92°
18"			81°	87°	90°	98°
21"				93°	96°	105°
24"					100°	107°
27"						114°

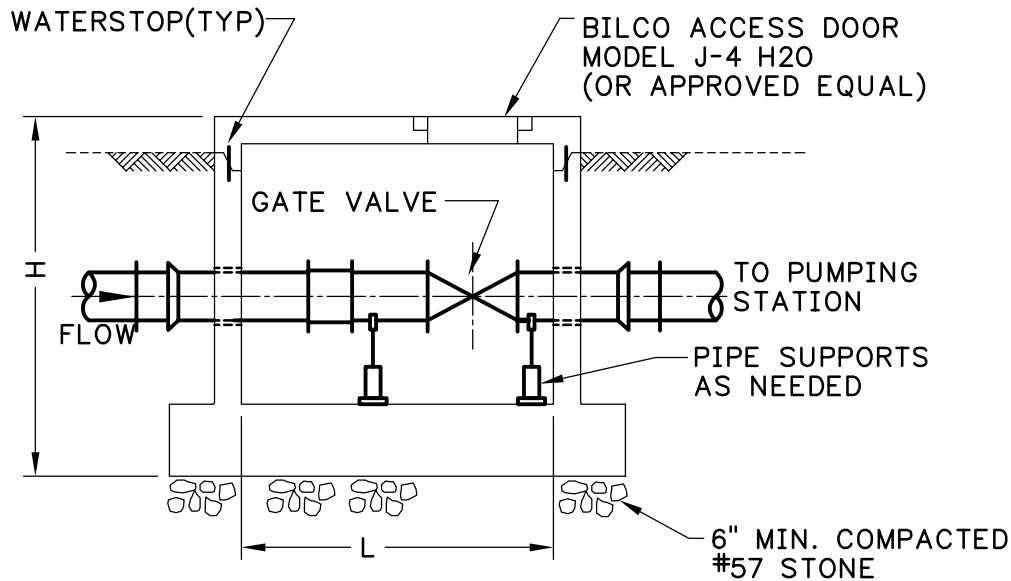
PIPE SIZE	60" DIAMETER MANHOLE									
	12"	15"	18"	21"	24"	27"	30"	33"	36"	42"
12"	47°	50°	55°	60°	62°	66°	72°	78°	82°	105°
15"		55°	60°	63°	66°	71°	76°	81°	85°	110°
18"			63°	68°	70°	75°	80°	85°	90°	112°
21"				72°	75°	80°	85°	90°	95°	115°
24"					77°	81°	87°	95°	100°	118°
27"						85°	91°	97°	102°	125°
30"							95°	102°	105°	128°
33"								108°	110°	133°
36"									115°	140°
42"										160°

NOTES

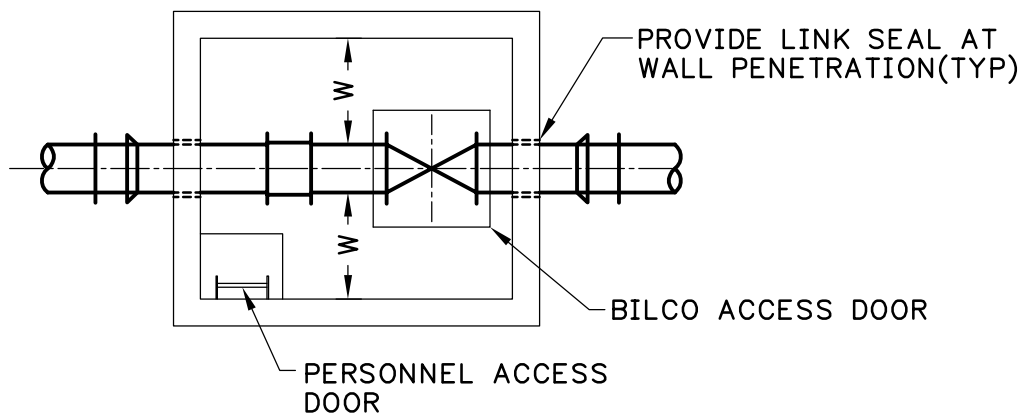
1. THE ABOVE ANGLES ARE TO BE MAINTAINED FOR THE STRUCTURAL INTEGRITY OF THE MANHOLES. SMALLER ANGLES MAY BE ALLOWED WITH PRIOR APPROVAL FROM THE DEPARTMENT.
2. FOR LARGER PIPE SIZES AND LARGER MANHOLES, SUBMIT DESIGN CALCULATIONS AND CERTIFICATION FROM THE PRECAST MANHOLE MANUFACTURER.

NO SCALE

C.S. 50



VAULT SECTION



VAULT PLAN

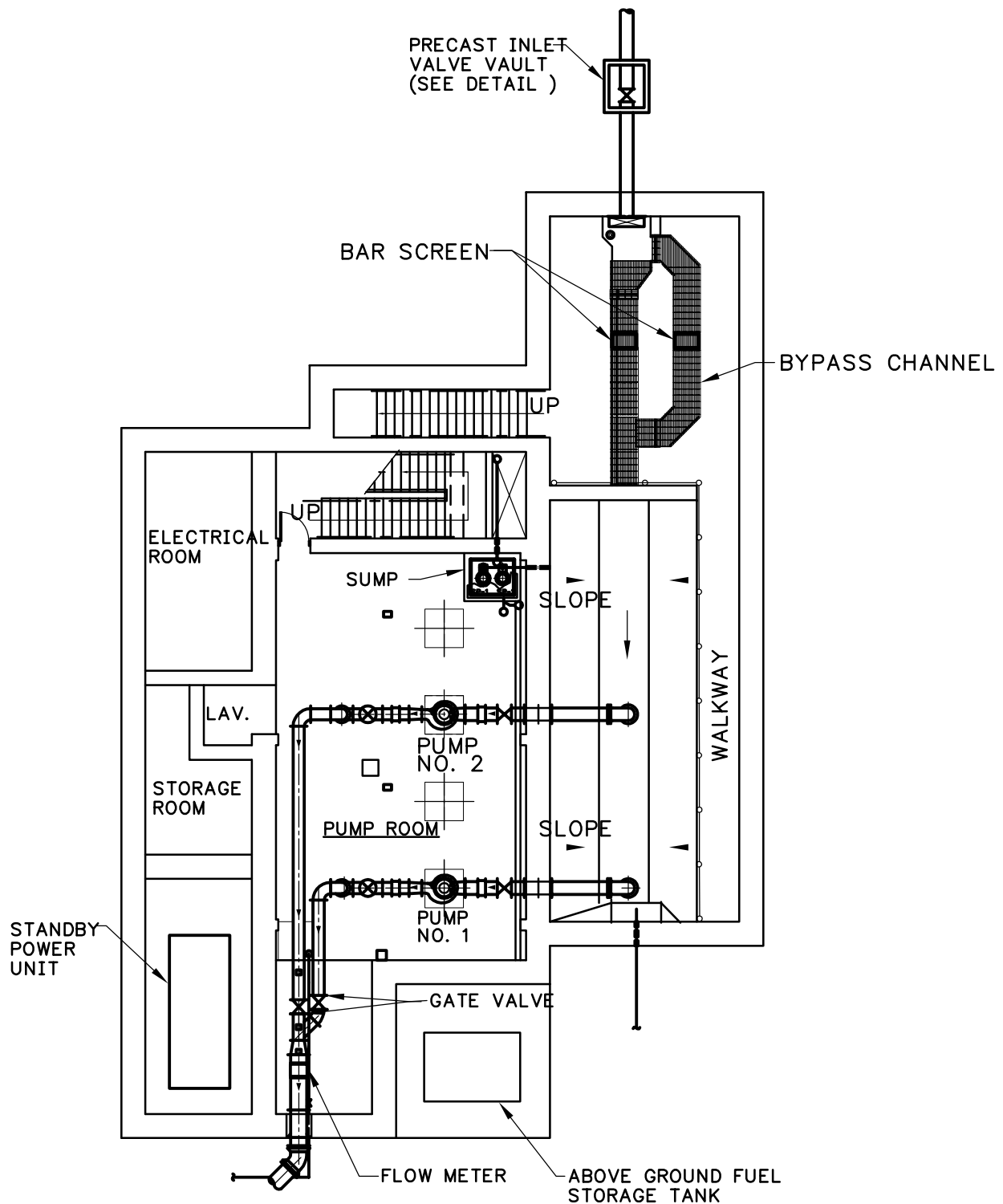
PRECAST CONCRETE NOTES

1. PRECAST UNITS SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER PRACTICING IN THE STATE OF VIRGINIA
2. PROVIDE CONCRETE WITH A MINIMUM F'C= 5000psi @ 28 DAYS
3. VAULTS SHALL BE DESIGNED FOR H₂O LOADING + 1'-0" EARTH COVER + 35% IMPACT
4. "H" WILL VARY BASED ON INFLUENT SEWER DEPTH
5. "L" SHALL BE 6' FOR 12" PIPE AND SMALLER AND 8' FOR LARGER PIPE
6. "W" SHALL BE A MINIMUM OF 2' FROM OUTSIDE DIAMETER OF VALVE OR OPERATING NUT TO VAULT WALL
7. ACCESS DOOR SHALL BE SIZED TO ALLOW EASY ACCESS TO THE GATE VALVE OPERATING NUT. CONFIGURATION OF THE VALVE AND LOCATION OF THE NUT WILL VARY DEPENDING ON SIZE AND ORIENTATION OF THE GATE VALVE.

PRECAST CONCRETE VALVE VAULT

NO SCALE

CITY OF NORFOLK, VIRGINIA
DEPARTMENT OF UTILITIES

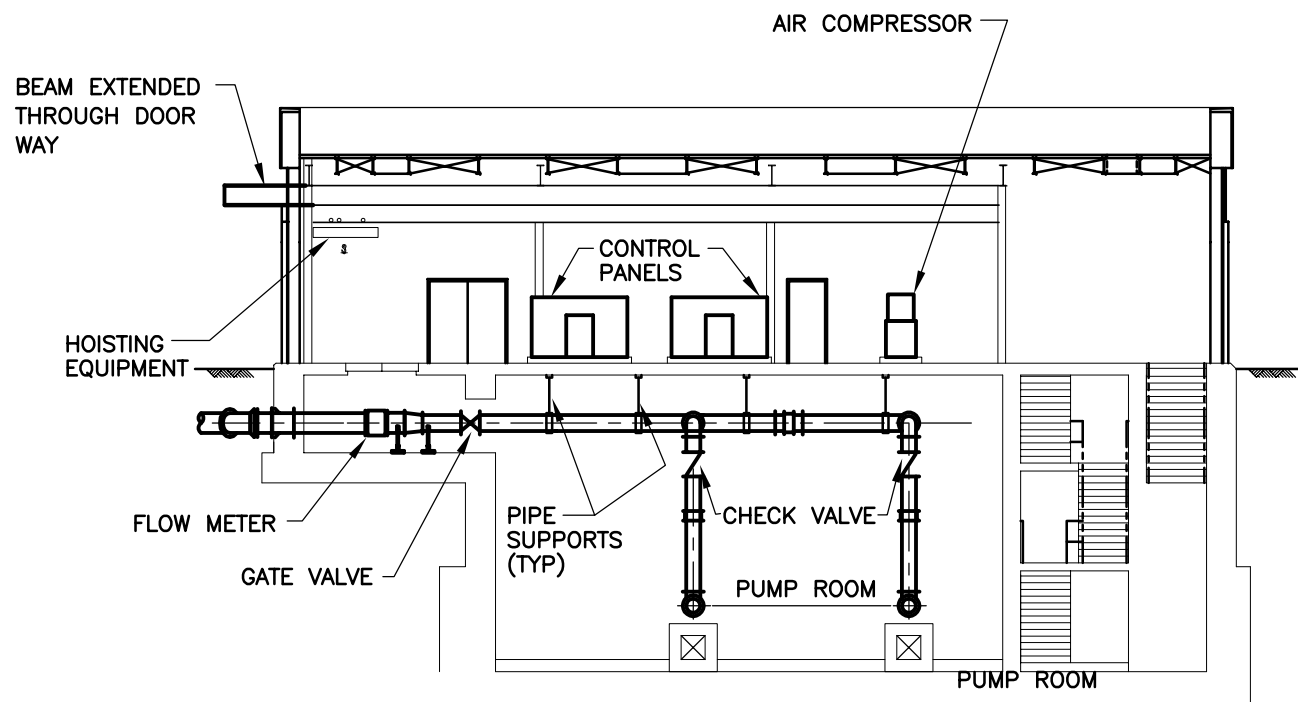


PLAN VIEW

TYPICAL PUMP ROOM

NO SCALE

C.S.52A

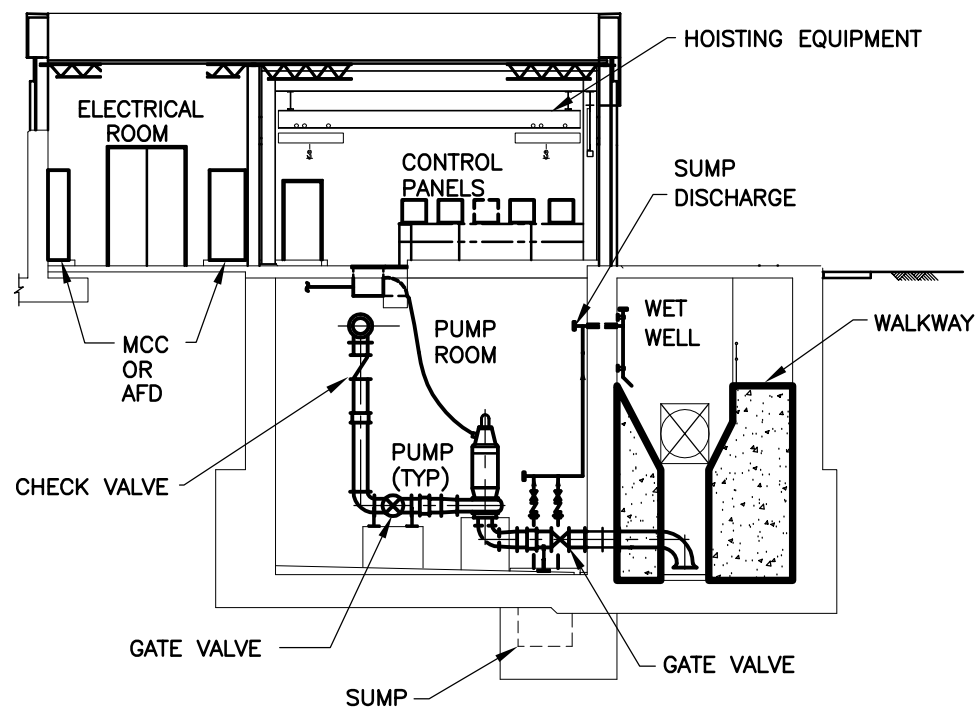


ELEVATION VIEW

TYPICAL PUMP ROOM LAYOUT

NO SCALE

C.S. 52B



ELEVATION VIEW

TYPICAL PUMP ROOM

NO SCALE